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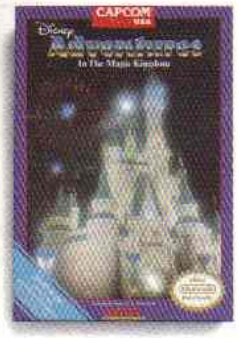

Goofy left the Golden Key inside the Enchanted Castle. Without it, the parade can't begin! To enter the Castle, you must help Mickey Mouse find six Silver Keys that are scattered throughout the Magic Kingdom. Can you find them?

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ON OUR COVER

The *Galileo* spacecraft heads out to Jupiter. Cover illustration courtesy NASA.

TNT News Blasts

Landlubber

Scientists have made a whale of a find. They found fossils that prove whales once lived on land 50 million years ago. The hind legs and foot bones of a whale ancestor were discovered in an Egyptian desert that was once a sea.

Since the 1800's, scientists have thought that the first whales might have had legs as well as flippers. But they failed to dig up any proof—until now. "Finally, we've got the bony evidence," said Dr. Lawrence G. Barnes, a fossil expert.

The two-foot-long legs were always flexed at the knee. That way, when the sea creature wasn't walking, its hind legs could fold back against its body.

Scientists believe that when whales first appeared, they probably lived much like seals do today: The 50-foot sea monsters spent part of the time on the beach and the rest of the time getting their feet wet!

ILLUSTRATION BY RACHEL CORNETT

Read My Lips

In the near future, computers will be giving lots of lip service —if computer expert Ben P. Yuhas has any say about it.

That's because Yuhas has been training a computer to lip-read.

For years researchers have been trying to make computers understand speech. There *are* speech recognition machines that respond to voices. "But speech recognizers perform poorly when there's a lot of background noise," explains Yuhas.

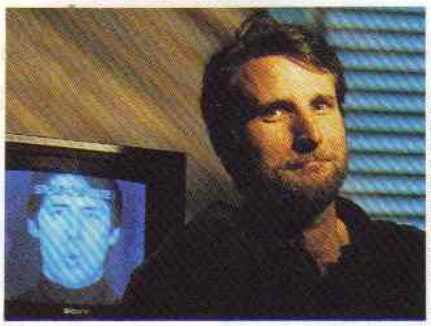

PHOTO © KATHERINE LAMBERT

"When it's noisy, people look at faces and lip-read to help themselves hear," Yuhas says. So he decided to teach a speech recognition machine to read lips.

To teach it, he showed silent pictures from a video laser disc– that's how the computer "sees"– of a man's mouth saying vowels. He then trained the computer to match real sounds with the picture shown.

Yuhas' program still has a way to go, but who knows? Computers may eventually be able to lip back!

Story suggested by Caroline Baker, Maitland, FL.

Honey, I Shrunk the Plants!

You'll never hear plants say, "Look, but don't touch." But if they could talk, that's what they might say!

Two scientists at Stanford

PHOTO © RUNK/SCHOENBERGER/GRANT HEILMAN

University in California have discovered that when a plant is touched, it grows shorter and stockier than untouched plants. What's the reason? The scientists identified genes in plants that they think may stunt its growth. (Genes are tiny units of a cell that determine physical characteristics.)

This may be one reason why Japanese bonsai trees stay so tiny. They are constantly being shaken and clipped. "Plants aren't just sitting there," says researcher Ronald Davis. "If you even brush a tree, it senses that and responds." (It's okay to touch plants–just not all the time!)

PHOTO COURTESY NASA

Red Rover

What's 12 feet tall, has six legs, and is both brainy and tough enough to survive on Mars? The answer: Ambler, NASA's new walking robot.

The robot, which looks like a spider, is being developed to explore the surface of Mars. It would roam Mars for a year or more, collecting information to help scientists choose sites for human exploration. (Before a crew of humans can set sail for the red planet, its surface has to be surveyed. Its winds and climate also have to be studied.)

Ambler is specially designed to amble over rocky areas: Its jointed "legs" can step over cracks and large rocks. As the rover creeps across the planet, an on-board computer will make maps and study weather patterns and the soil. The information will be beamed back to Earth by satellites.

When will the rover be ready to take its first steps? NASA says the space odyssey could take place by the year 2001.

Hams Across America

This oinker may not win any beauty contests, but the Fengjing pig is prized for another reason. The Chinese pigs produce three or four more young per litter than U.S. breeds.

The pigs will soon be coming to America to take part in a special "exchange program." U.S. pig breeders hope to increase the size of American pig litters by crossbreeding them with the Fengjing pigs. Now that's what you call bringing home the bacon!

PHOTO © USDA/AGRICULTURE RESEARCH SERVICE

So What's New?

You tell us and you'll get a nifty CONTACT T-shirt—if we print your story. Send us any science story from the news that you think our readers would like to know about. (Be sure to tell us your T-shirt size and where you heard the story.)

Send to:

TNT
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New York, NY 10023

ANY QUESTIONS

By Linda Movish

WHY CAN YOU HEAR THE ROAR OF THE OCEAN IN A SEASHELL?

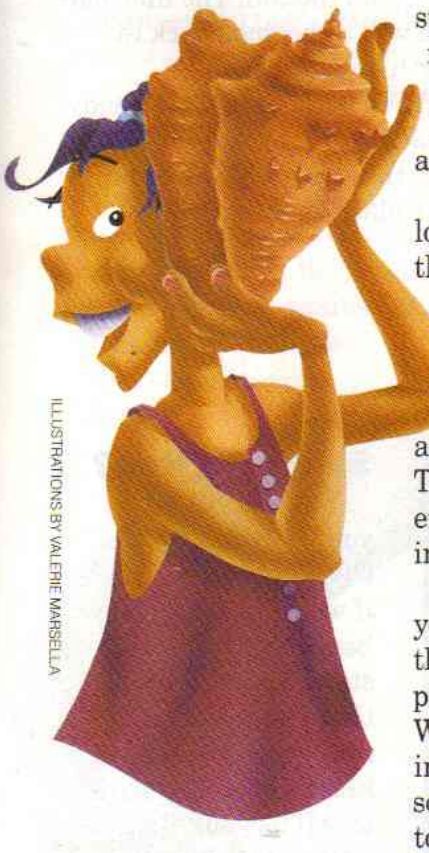
When you hold a shell to your ear, suddenly, there's the ocean! But, really, the sounds you hear in a shell have nothing to do with the ocean. They are simply the stray sounds around you and inside your ear.

The noise around you is made louder by the vibration of the air in the shell. The air molecules are bumping into each other. What you hear just sounds like the waves of the ocean.

You can hear the same thing in an empty coffee can or even a cup. That's not the sound of the ocean either. It's just the vibration of air inside your ear.

When you control that vibration, you can make beautiful music. Much the same kind of vibration takes place in musical instruments. When you strum a guitar, for instance, the strings vibrate. The sound waves pass through the wood to the air trapped inside the guitar. The air vibrates, making the sound greater. It's music to your ears!

Question sent by Melissa Davidson, Bellevue, WA.



ILLUSTRATIONS BY VALERIE MARSELLA

WHY DO PEOPLE HICCUP?

Hic! There are many causes of hiccups. Usually people get them from eating too much or too fast.

Between your stomach and chest is a sheet of muscles called the diaphragm (say: DIE-uh-fram). When you breathe, your diaphragm pushes air in and out of your lungs.

Usually your diaphragm works at a nice, even pace. But sometimes, when an organ around it (like your stomach) is irritated, it does not. Your diaphragm gives a series of quick little jerks. The result of these muscle spasms is a case of the hiccups.

Usually hiccups go away in a few minutes. But if you can't wait, here are a few cures that sometimes work: 1. Sip a glass of water. 2. Get someone to scare you. 3. Breathe into and out of a paper bag. 4. Hold your breath as long as you can.

Finally, here's one that your dentist will hate! Eat a teaspoon of sugar.

Question sent by Jason Kelly, Miami Beach, FL.

WHY DOES MY SHADOW GET TALLER IN THE WINTER?

During the cooler months of the year, your shadow *is* taller. However, it has nothing to do with the weather.

Your shadow changes with the seasons. The change of seasons—and how long or short your shadow is during those times of the year—is caused by the slant of the Earth's axis. (The axis is an imaginary line through the center of an object, around which an object turns.)

For six months the northern part of the Earth gets less sunlight because the axis is tilted away from the sun. And in the summer it catches more rays because the axis is tilted toward the sun.

So, your shadow "grows" in winter because the Earth is tilted away from the sun and its rays hit you at an angle. In the summer your shadow "shrinks" because the sun's rays hit you at less of a tilt.

You might also notice the length of your shadow depends on the time of day. Each day your shadow starts out long and shrinks as the sun rises in the sky. At noon, your shadow is shortest of all.

Question sent by Heather O'Leary, Mohegan Lake, NY.

DO ANIMALS CATCH COLD?

Only if they're speedy! Actually, animals *do* get colds by catching germs in the air from other animals. A sheep can catch cold from another sheep, and a monkey can give it to another monkey. But people cannot catch colds from animals and animals cannot catch colds from people.

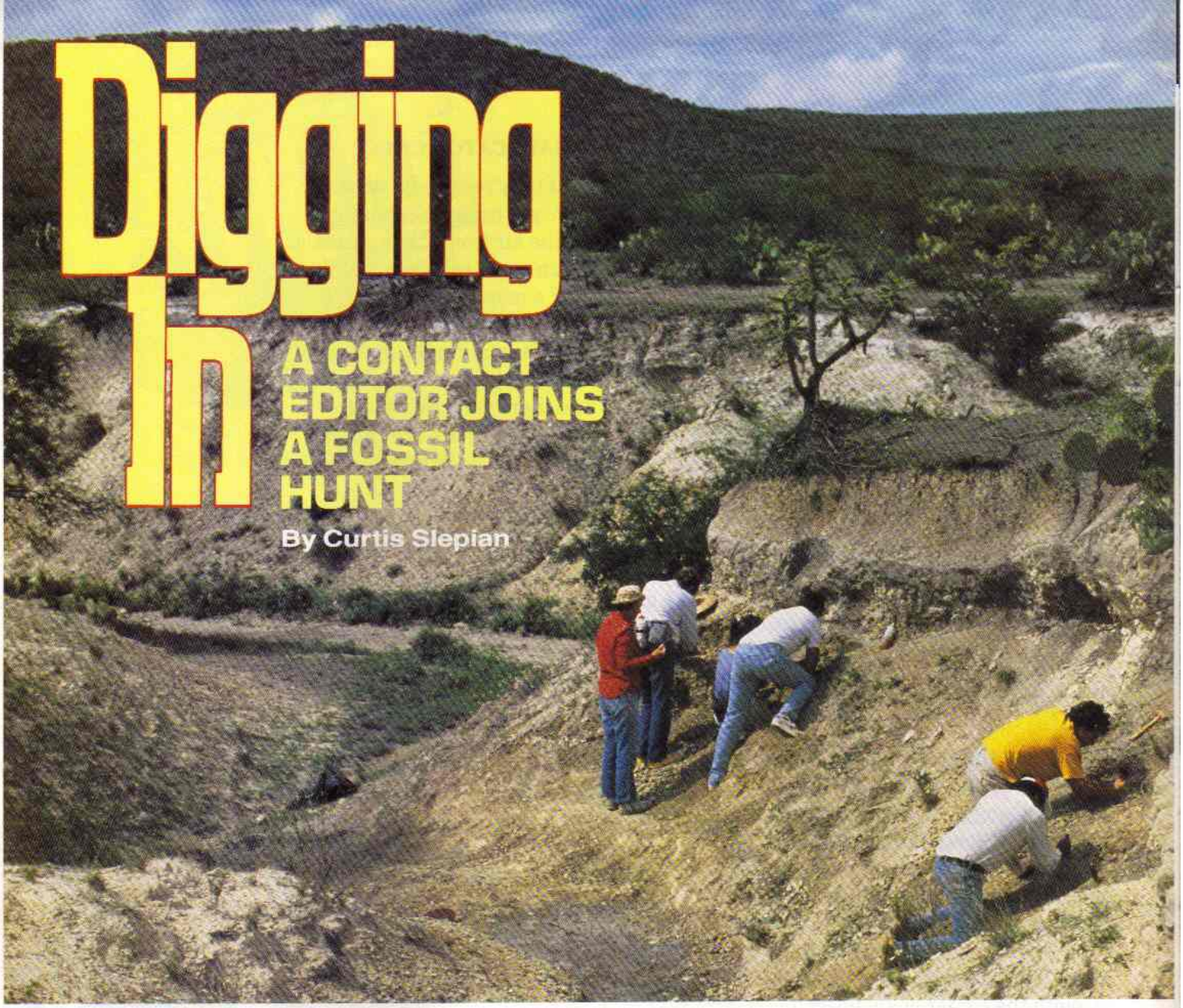
While there is no way to cure an animal's cold, there are things a veterinarian can do to help animals feel better.

For example, when a bird gets a cold, it is taken from its group and put in a special cage. The doctor then gives it steamed medicine to help it breathe easier until the cold is gone. But if a cow catches cold, it isn't separated from its herd. The doctor will keep the sick cow with its "family" because it will get better faster.

When an animal has a cold, it gets tired easily and sleeps a lot. It also doesn't have much of an appetite when it catches cold. But, one thing you'll never catch it having is a tissue!

Question sent by Joanna Lynn Kieschnick, Rockwall, TX.

Do you have a question that no one seems able to answer? Why not ask us? Write to: Any Questions? 3-2-1 Contact, P.O. Box 40, Vernon, NJ 07462



Digging In

A CONTACT EDITOR JOINS A FOSSIL HUNT

By Curtis Slepian

KACHUNK! KACHUNK! As the sun beats down on the back of my neck, I slam my pick into the side of the hill. Kachunk! "There's gotta be a bone here somewhere," I think, wiping sweat out of my eyes. I slam the pick again. Kachunk! "When am I going to find some bones?"

I'm in Mexico digging for prehistoric fossils. I got the chance because of an organization called Earthwatch. They make it possible for ordinary people to help scientists do their work in the field. The field in this case is located in the central Mexican state of Guanajuato. And the people on the expedition are school teachers, a dental hygienist, and me, an editor from 3-2-1 CONTACT. What do we have in common? We want to find fossils but don't know how.

Luckily, two experts are in charge of our group: one is Oscar C. Castañeda, a researcher at the Autonomous University of Mexico. The other is Wade E. Miller, a professor at Brigham Young University in Utah.

Both men are paleontologists (say: pay-lee-on-TAL-o-jists). A paleontologist, says Castañeda, is a scientist who "looks for and describes the life of the past." The past life they study is so old, nothing remains of it except ancient bones—called fossils. Over millions of years, these bones have absorbed minerals in the ground and become hard.

A Painful Start

Our search for fossils begins with a ride to a ranch some four and a half hours north of Mexico City. Soon after arriving, Oscar sends us out to dig. On the walk to the dig area, I smell flowering cactus, hear the gobbling of wild turkeys, see red army ants—and twice step on mesquite needles so sharp they go right through my sneaker and into my foot. Not a great way to start.

The dig site is in a deep arroyo, a kind of dry river bed. With an icepick, I start to jab

Earthwatchers really dig searching for fossils in El Ocote, Mexico.

PHOTO © SHEILAH CROWLEY

away at the steep side of the arroyo. Cutting away at the earth is easy because it is soft and crumbly. The fossils we are looking for are from mammals who lived four to five million years ago. If we had been looking for dinosaur bones, which are older, the ground would be more rocklike.

I dig for a while before it hits me—I don't really know what a fossil looks like. Before I started, I thought fossil-hunting would be a snap: After a little digging, I'd spot a bone sticking out of the ground—like the one a dog would bury in the yard, only bigger. I imagined that I'd make a major find in no time and everyone would pat me on the back.

But as I found out, it's a lot harder than that. For example, Peter, a science teacher from Massachusetts, spends a long time carefully digging what seems to be a giant white bone—maybe the leg bone of a ☞

ALL PHOTOS EXCEPT WHERE NOTED COURTESY CURTIS SLEPIAN

With a sure touch, expedition leader Oscar Castañeda carefully unearths several bones.

At the end of the day, we check dirt taken from the dig area for small fossils. To do this, the dirt is placed in plastic mesh bags, which are lowered into a drum of water (top). This filters out clay and silt. We spread out the remaining rocks and fossils to dry in the sun. Afterwards, I go over them by hand, picking out teeth and bones.

mammoth, he hopes. Finally, Oscar comes over to see. "It's rock," he says, smashing into the "bone" with his pick. Oh, well.

And forget about pulling an entire skeleton out of the ground, or the head of a rhino, complete with horn. Actually, it's tough enough finding a single unbroken bone. Most of what we find are bone "fragments," which aren't very useful to scientists.

Paleontologists can't identify an animal from a fragment. But they can identify it from a single "complete" bone—a bone with at least one end intact. Oscar and Wade figure out an animal from one of its bones as easily as you can guess a soft drink brand from the shape of its bottle. But, says Wade, "It takes a long time to learn the skeletons of so many animals."

So in the hot afternoon sun, we Earthwatchers use picks, hammers and pickaxes to find complete bones. An hour later, I've found exactly...nothing. Ann, a retired schoolteacher from Chicago, is digging a few feet away. She's doing no better: "Where are the bones?" she cries in frustration.

Meanwhile, I believe I've made the discovery of the century. It's round and smooth and the size of my palm. To my inexpert eyes, it looks like the head of some ancient rabbit. "See," I tell Ann, "there's the rabbit's eye, and there's his nose, and there's his ear." I call over Gerardo, Oscar's assistant, to have a look. He just laughs. It's a rock, he says. So much for my major discovery of a prehistoric Bugs Bunny.

By the end of the first day, a few people have managed to get some small fossils. All I get is a bad case of sunburn.

That evening, after dinner (and after I've dumped a few tons of dirt from my sneakers), Oscar tells us that this part of Mexico is a great place to find fossils. Millions of years ago it had plenty of vegetation and water. Now-extinct bears, camels, saber-tooth tigers, lions, sloths and other animals made pit stops here while migrating between North and South America.

Since 1974, Oscar has been working these rich fossil deposits. He promises that we will find plenty of bones tomorrow. As I drift into sleep that night, I worry: What if I'm the only one who doesn't find a fossil?

The next day, we get up early and drive in two vans to another dig site, El Ocote. It is located in a high valley, an empty land where farmers use donkeys to plow corn fields.

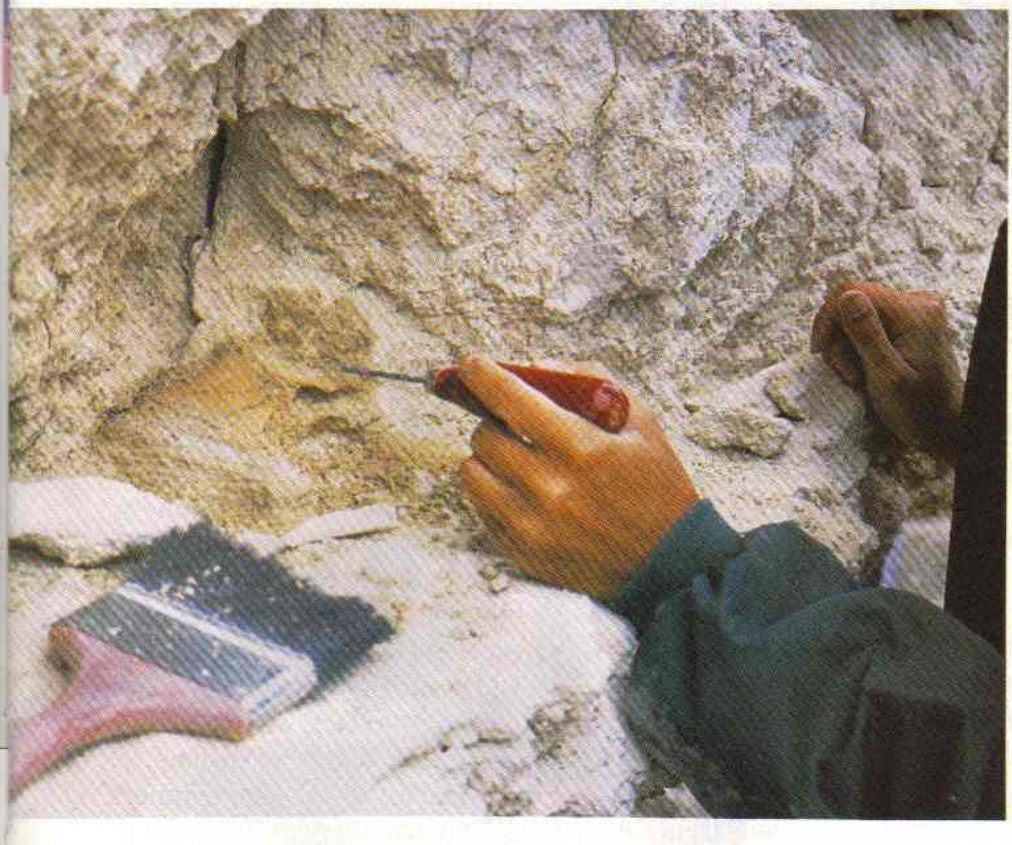
PHOTO © SHEILAH CROWLEY

Rubén, right, takes time off from goatherding to go fossil hunting.

Tools of the trade:

Pick and brush expose a pink-

colored fossil buried by time.



A Bone to Pick

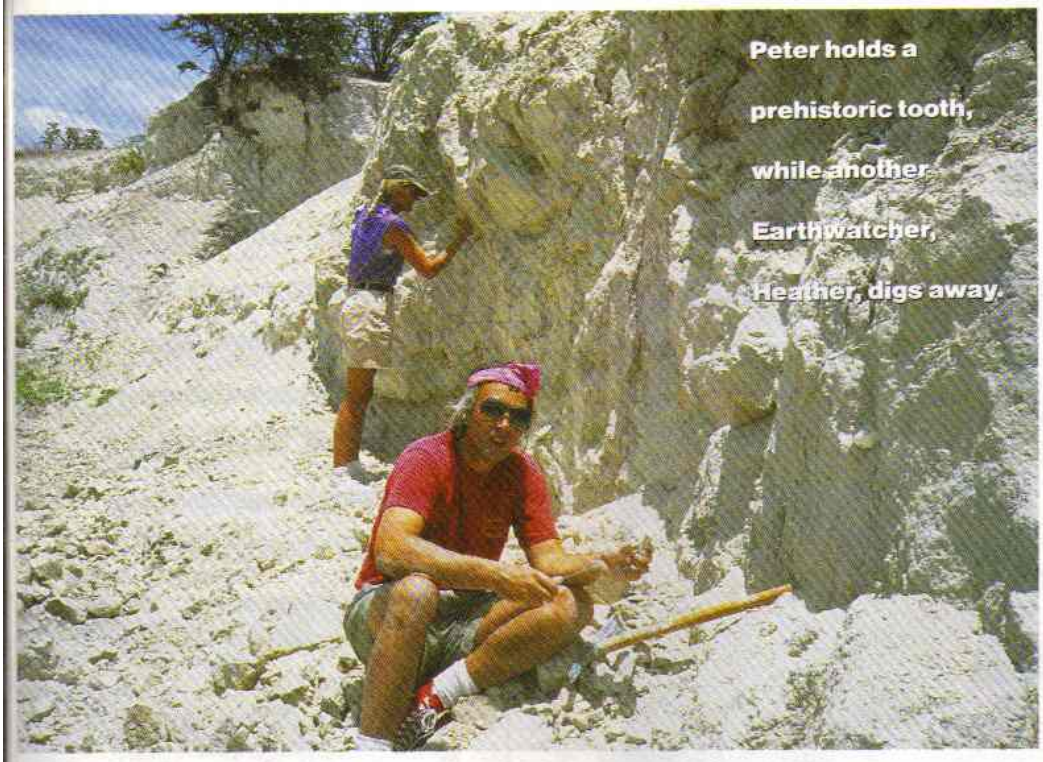
Today I find my first fossil! Excitedly, I clear away about eight inches of the bone with my pick. But sometimes I dig too close to the bone, and part of it breaks off. And as I brush it to remove dust, the bone starts to flake apart.

I'm discovering something else about fossil-hunting: It's hard to find fossils, but once you do, it's easy to destroy them. The bones are very delicate. Often the slightest pressure will make them crumble to dust.

Oscar comes over and gives me a mini-lesson on how to properly uncover a fossil. "Dig above the fossil, not below," he says. "If you dig below, the ground holding the fossil might collapse, smashing the bone. Clear a layer so the bone sits on a 'flat table.' " Oscar takes a pick and like an artist digs around the edges of the fossil. "It's a rib," he finally decides, "but it's only a small piece of it. No good." At least I didn't ruin a good fossil.

Oscar gives me another spot. He points to the long tooth of an extinct horse sticking out of the ground. Because of the enamel in them, teeth are the best-preserved part of a skeleton. But this one isn't in top shape. So Oscar takes out a plastic container holding liquid glue and squirts the tooth. The glue should harden the bone. He tells me to "work all around the sides of the tooth, then get behind it and remove it." ☞

To make a fossil "jacket," Gerardo (top) first makes gooey plaster of Paris. Next, Oscar drenches burlap strips in the plaster, layering them over the fossil. He then coats them with more plaster. When the plaster dries, Oscar and Dr. Miller remove the cast from the earth. The many casts made during an expedition go to a university laboratory.



Peter holds a prehistoric tooth, while another Earthwatcher, Heather, digs away.

I guess I wouldn't make much of a dentist. When I pry out the tooth, it breaks into 20 parts. I'm glad to see that Oscar, working elsewhere, doesn't notice.

Late in the morning, the Earthwatchers find themselves surrounded by a dozen goats. The goatherd is a young boy named Rubén. He shyly watches us work. But his curiosity gets the better of him and he soon joins us. Sifting through earth broken from the sides of the gully, he helps find a huge mastodon tooth, a rhino tusk and the perfectly preserved molar of a peccary (a kind of pig). He's already done better than I have!

Fossils in a Jacket

After a lunch of cactus sandwiches (yes, cactus meat—it tastes great on a fresh tortilla), it's back to work. Gerardo uncovers a pretty big fossil—the jaws of a camel. He digs all around the bones, except under them. He is going to remove the fossil with a plaster "jacket." Delicate bones are usually taken out this way, so they won't break.

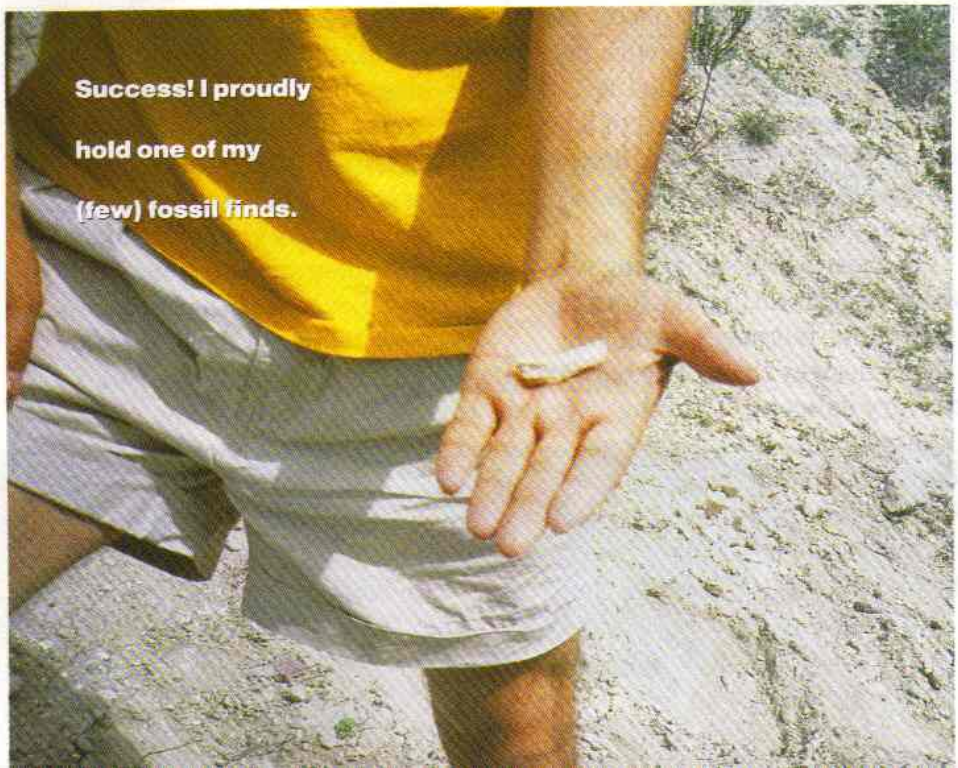
Much later, the plaster cast will be taken to a laboratory at Oscar's university. In the lab, the plaster and dirt are removed from the fossil. After the bones are hardened with resins and chemicals, they are catalogued and stored with fossils from the same area. Now Oscar and other scientists can study them whenever they wish.

Fossils like the ones we find allow scientists to figure out when these ancient animals lived. The fossils also help tell scientists what parts of the world the animals migrated to. Knowing all this, scientists can better figure out which prehistoric beasts are the ancestors of present-day animals.

Over the last few days, we haven't done badly: We've dug up a rare bird fossil, some camel jaws, a carnivore skull and assorted teeth. The next day we do even better. Well, Gerardo does.

He has discovered the tiny legs, hands and skull of some rodent. He isn't sure exactly what animal it is. Wade Miller looks at it for a while, then says: "It's a rabbit." A five-million-year-old rabbit! And unlike my rabbit-shaped rock, this ancient bunny is the real thing. It's an excellent find, says Dr. Miller, and we're all excited to have been part of it. In fact, we're pretty proud of the work we've done, considering we're just beginners.

I'm tired, dirty and sore from sunburn—but for the chance to know what a scientist goes through, for the thrill of discovery, it's all worth it. ◆



Success! I proudly hold one of my (few) fossil finds.

MISSION IM-FOSSIL-BLE!

Here's a way to make your own "fossils" — without getting sunburned or having cactus needles in your feet!

What you'll need

- A shoe box or other small box
- Modeling clay
- Plaster of Paris
- Items to make fake fossils — nails, pencils, coins, shells, bottle caps, etc.

What You Do

1. Make an even layer of clay about one inch thick in the bottom of the box. Use your hands and fingers to make the clay smooth and soft. Be sure to fill in all corners of the box.

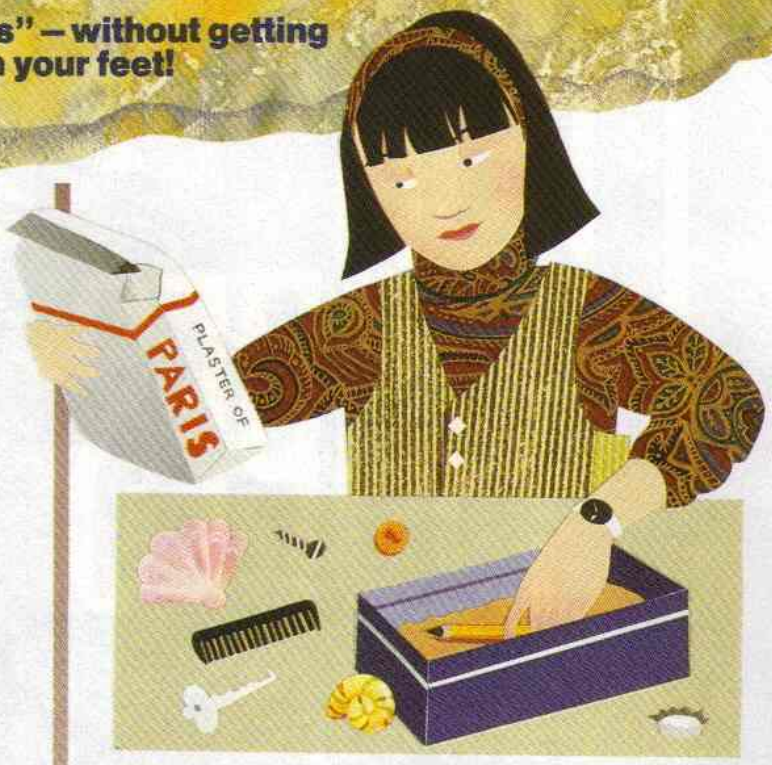
2. Take your fake "fossils" and press them into the clay so they leave an impression. Remove the items and clean the clay off of them.

3. Mix the plaster of Paris according to the directions on the box. Pour the plaster into the box so it covers the clay. You'll need enough plaster to make "rock" 1½ inches deep.

4. Let the plaster harden completely. When it has dried, carefully tear away the box.

5. Peel away the clay from the plaster. You can remove any clay that still remains by running the plaster under water and gently rubbing it with an old toothbrush.

6. Ask your friends or family if they can identify your fossils.



Why it works

In the story in this issue, you read about searching for one type of fossil. This experiment shows you how to "make" another kind of fossil that was created when layers of dirt or clay formed over dead animals or plants and squashed them flat. Eventually, the dirt turned to stone. Minerals in rainwater ate away the hardened skeleton until it disappeared. All that was left was a hole in exactly the same shape as the skeleton. It was a fossil — a perfect copy of a dead animal or plant that had lived long ago.

Your fake fossils were made in a similar way. Only it took a few hours — instead of millions of years — to do!

ILLUSTRATIONS BY JOLYNN ALCORN

HIGH HOPES

NASA LAUNCHES FIVE FAR-OUT MISSIONS

by Russell Ginns

We've walked on the moon. We've sent spacecraft to photograph every known planet except for Pluto. We've even landed a robot on the surface of Mars. After more than 30 years of adventures and achievements, what's left for NASA—the U.S. space agency—to do? Plenty!

According to Jim Wilson of NASA's Jet Propulsion Laboratory, the triumphs of *Voyager*, *Viking*, and the *Apollo* astronauts were only the beginning. "We have a good idea of the planets and objects that make up our solar system. It's time to find out how they work and how they got that way," he told CONTACT. "So, now we're going back with better instruments to get an in-depth look."

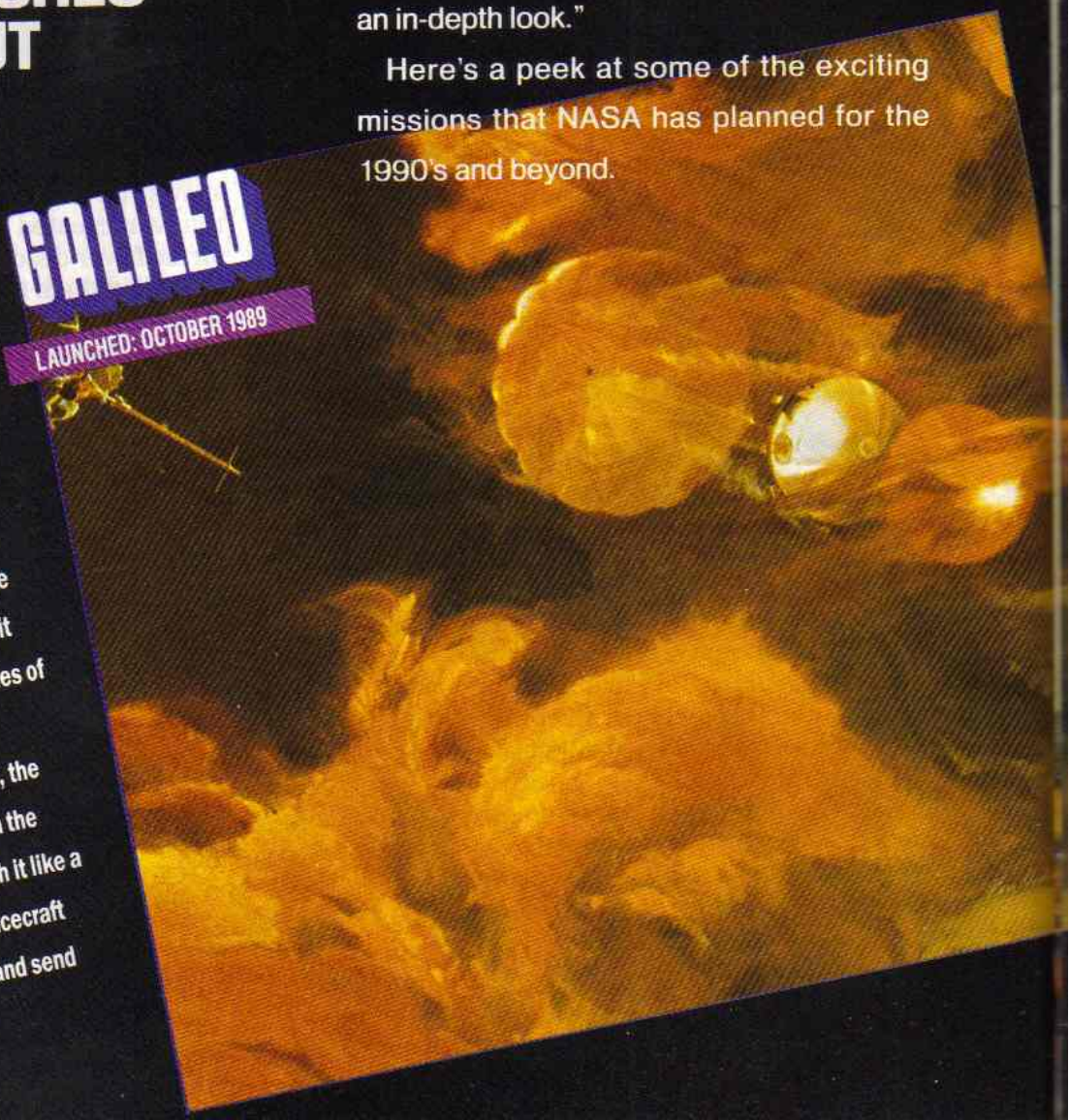
Here's a peek at some of the exciting missions that NASA has planned for the 1990's and beyond.

GALILEO

LAUNCHED: OCTOBER 1989

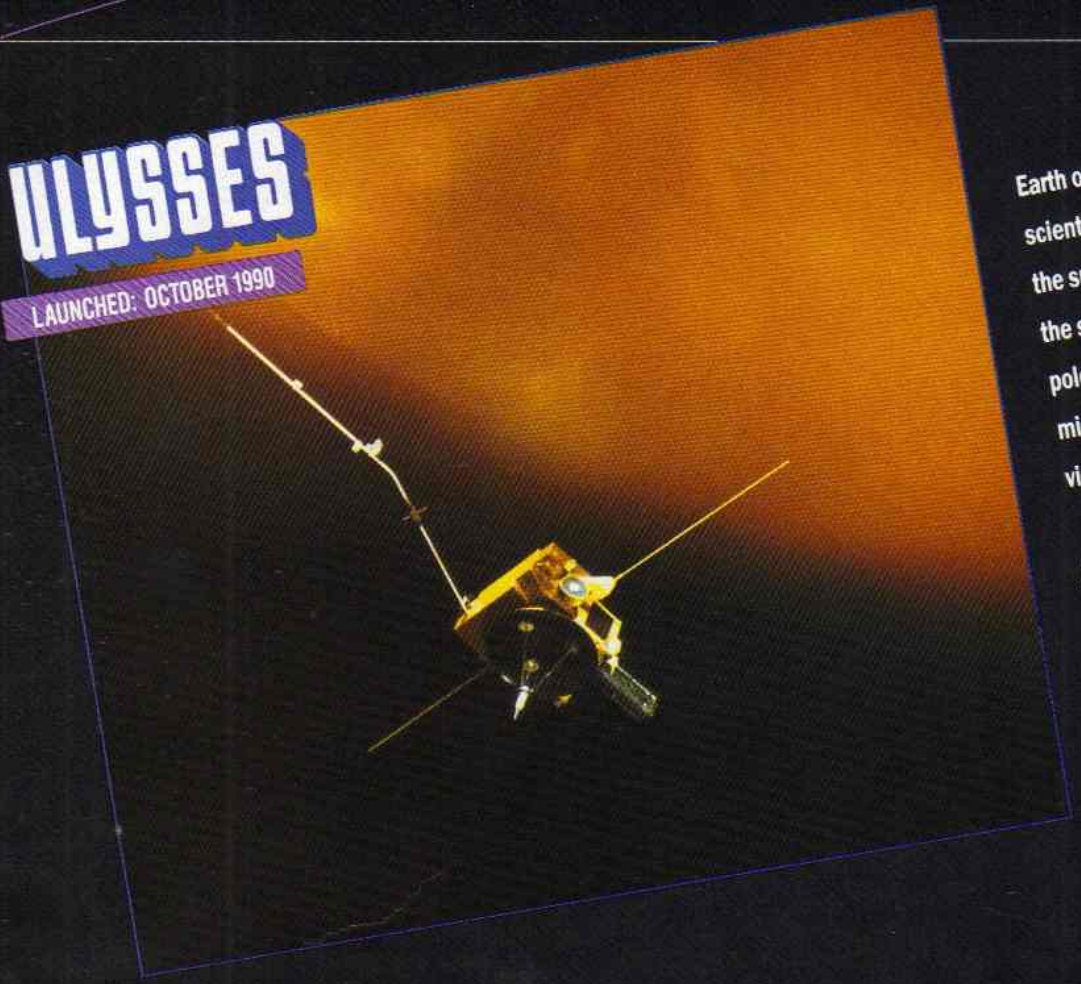
After a journey of more than one billion miles, Galileo will reach Jupiter in 1995. It will send back photos of the giant planet and its moons. Even more exciting, it will drop the Galileo Probe into the atmosphere of the planet. The probe will send back information as it plunges through more than 400 miles of Jupiter's stormy atmosphere.

After just a few hours, however, the probe will run out of power. Then the planet's high pressure will crush it like a paper cup. But the Galileo spacecraft will continue to orbit Jupiter and send back information for years.



ULYSSES

LAUNCHED: OCTOBER 1990

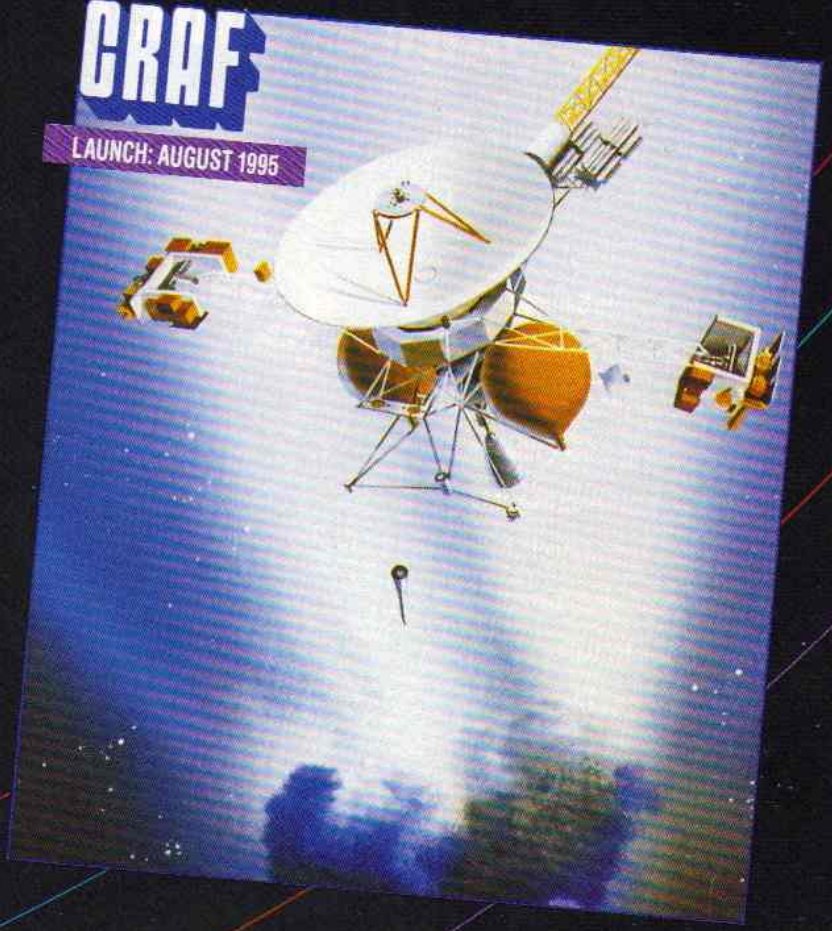


Earth orbits around the sun's equator, so scientists have only been able to study the sun from a side view. But, like Earth, the sun looks much different at its north pole than it does at its equator. This mission will give scientists their first top view of the sun.

The Ulysses spacecraft will race out to Jupiter and use that planet's gravity to fling itself into a new vertical orbit. In the summer of 1994, Ulysses will fly over the sun's north pole. It will measure radiation levels and conduct other experiments that should help us to see the sun in a different light.

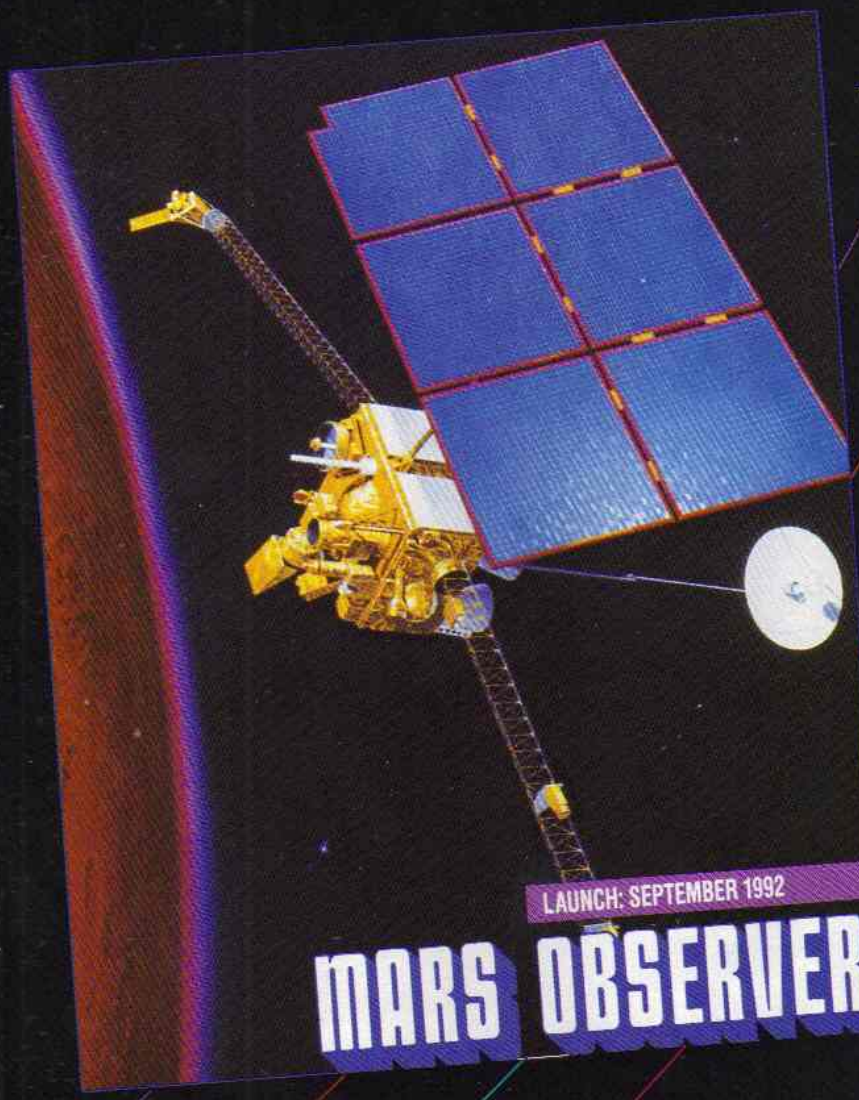
CRAF

LAUNCH: AUGUST 1995



In 1998, CRAF (Comet Rendezvous Asteroid Flyby) will zoom past the asteroid 449 Hamburga. Scientists will get their first close-up view of an asteroid. Then, in the year 2000, CRAF will meet up with comet Kopff. It will match orbits with the comet and follow it for almost three years as it travels around the sun. CRAF will also shoot a small golf tee-shaped probe into Kopff to gather information about what comets are made of.

COURTESY NASA

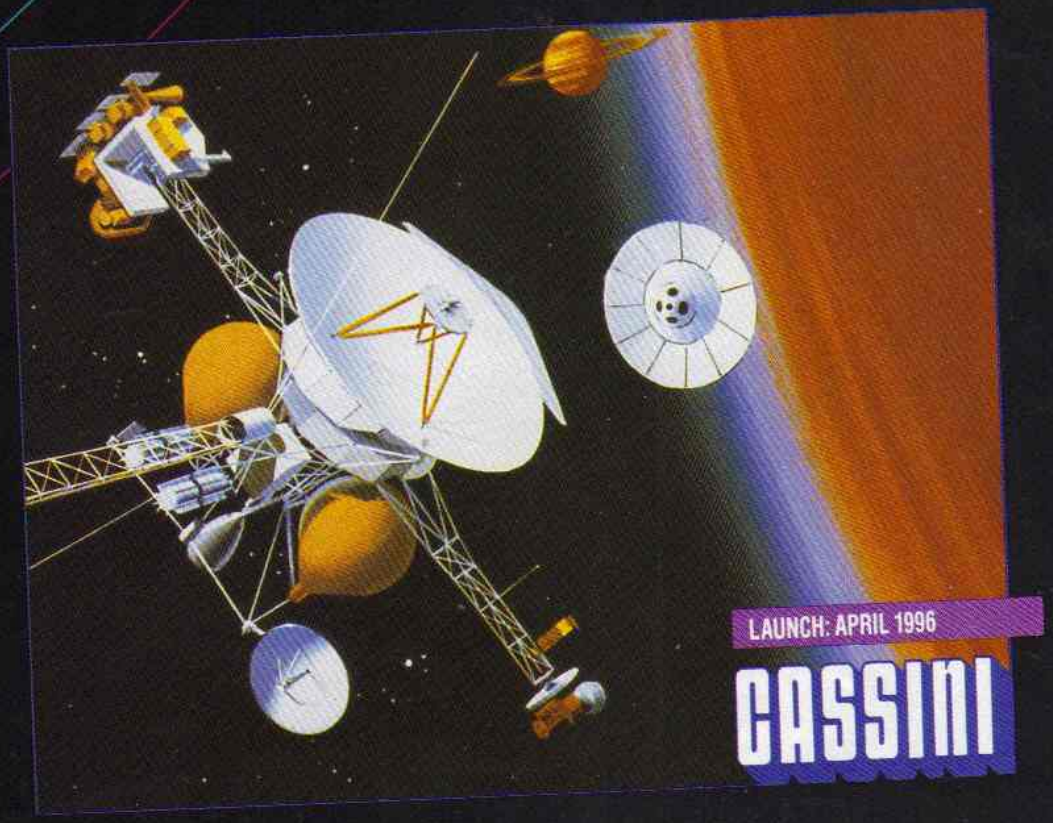


LAUNCH: SEPTEMBER 1992

MARS OBSERVER

The Mars Observer will orbit the "Red Planet" starting in August 1993. It will study the planet's surface, atmosphere and magnetic field for a full Martian year (687 days). The spacecraft will be carrying a much wider range of equipment than earlier Mars missions. This includes a radio system to share data with a Soviet satellite that will arrive one year later.

Scientists are hoping that *Observer* will tell them more about the history of water on Mars. There is no liquid water on the surface of the planet right now. But there is evidence that water flowed there long ago. The Observer's discoveries will also help NASA choose a landing site for a mission that could send people to Mars sometime next century.



LAUNCH: APRIL 1996

CASSINI

When *Cassini* reaches Saturn in 2002, it will carry out a mission much like the *Galileo* spacecraft. But instead of sending a probe into the ringed planet, it will drop one onto Titan, Saturn's largest moon.

As the probe drops by parachute, it will send back information about Titan's atmosphere. There's even a chance that it will survive a rough landing, and be able to tell us about the surface of that mysterious moon.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DRAWING

THE HIGH-TECH WORLD OF MAP MAKING

by Renée Skelton

PHOTO COURTESY NOAA

This computer-generated map of Prince William Sound in Alaska shows the habitats of wildlife.

It's late at night on March 24, 1989. The oil tanker *Exxon Valdez* slams into hidden rocks in Alaska's Prince William Sound. Millions of gallons of thick oil begin to leak into the clear waters.

Hundreds of people rush to the scene. Among them, a team of oil spill experts. The group is carrying an important clean-up tool: a computer that makes maps.

Within hours of the spill, the map makers are flying over the Sound. They draw in the oil-covered areas on a map of the Alaska coast. Then they transfer the information to their computers on the ground.

"We have a computer model that figures wind direction, tides, currents and the kind of oil that has been spilled," says Mark Miller. He is a program expert for NOAA—the National Oceanic & Atmospheric Agency—in Seattle, WA. "The computer gives us map information on where the oil is, and it predicts where the oil will move," Miller told CONTACT. Using the map, clean-up workers know where to

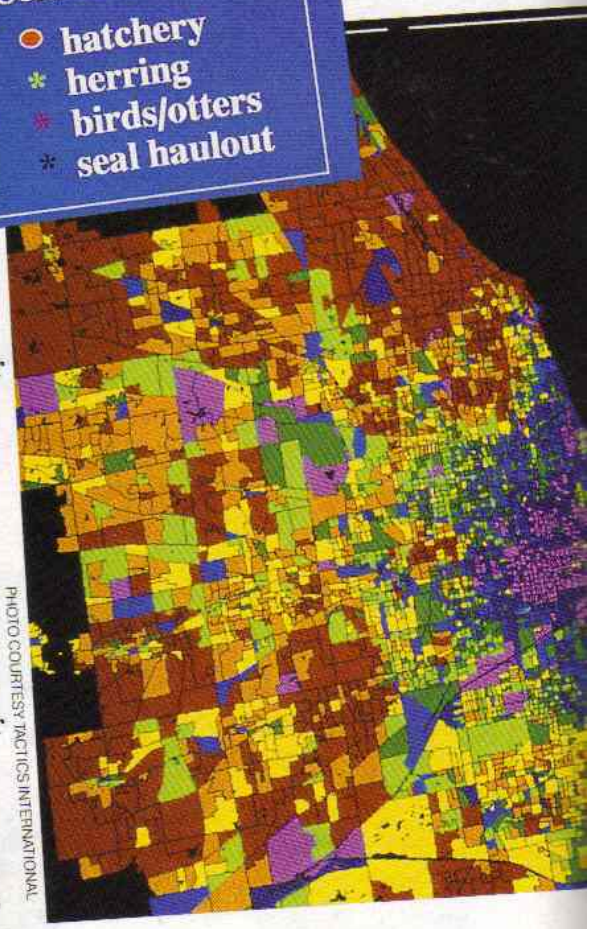


PHOTO COURTESY TACTICS INTERNATIONAL

THE LINES

put barriers to surround the oil.

Computers, such as the one that was used to chart the course of the Alaska oil spill have changed the face of map making. "Maps are the best way to show large amounts of information quickly and at a glance," explains Miller. And thanks to computers, maps have become a state-of-the-art science helping people perform their work better than ever before.

Before computers, people made maps by dragging heavy surveying tools around. They measured distances and made notes and sketches of landforms. Then the maps were drawn by hand.

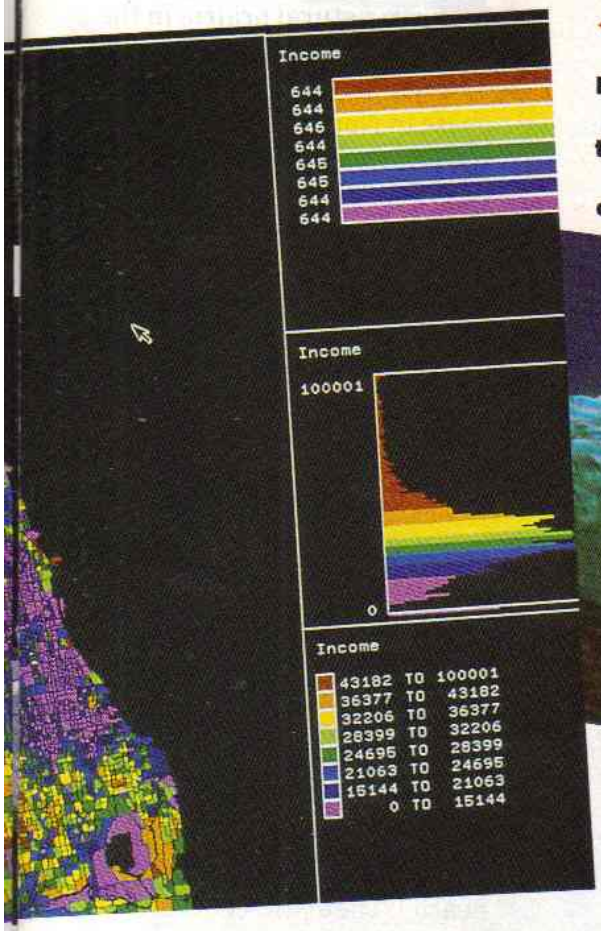
Today, however, cartographers (another name for map makers) use photos taken from planes and satellites to gather information to make their maps. But instead of putting every piece of information down by hand, cartographers enter all the map data into a computer. Then they tell the computer the kind of map to make. The computer will draw the map quicker—and often, more accurately—than the cartographer could by hand.

Getting Around

Maps made by computers do everything from helping firefighters locate buildings with dangerous chemicals to helping timber companies keep track of trees they cut. A new group of computer maps even helps emergency medical workers find their way around cities.

The Albuquerque, New Mexico Ambulance Service has a number of ambulances with navigation devices hooked up to them. The devices keep track of where each ambulance is—and feeds the information into a central computer at the service's headquarters. Symbols appear showing the location of every ambulance.

"When a 911 [emergency] call comes in, we can see the location on our maps," says John Tibbetts. Mr. Tibbetts is in charge of the computer system. "We can also see where the ambulances are. Then we send the information (caller, address and problem) to the closest vehicle." ☞



Businesses are using maps like this one of Chicago to help determine where to set up shop.

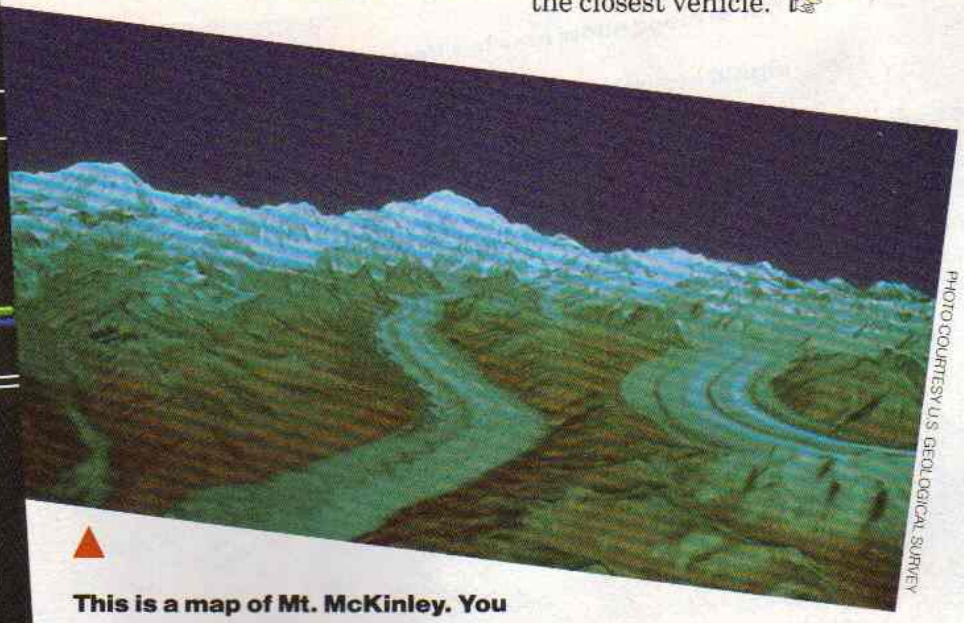


PHOTO COURTESY U.S. GEOLOGICAL SURVEY

This is a map of Mt. McKinley. You are looking at the mountain as if you were at a point 15,000 feet high.

The emergency workers receive the information on a computer screen placed in the ambulance. A map on the screen shows their location and the location of the caller. "It helps get the ambulance there quicker, so the chance of saving lives is much better," says Tibbetts.

The Sky's the Limit

Computerized road maps focus on small areas. But for the "big picture" there are high-flying maps made from satellite images. These help monitor large areas that are hard to cover on the ground. With special sensors, satellite images can show amazing things.

Take the Landsat satellite, for example. Landsat's sensors look down on Earth from over 400 miles in space. They sense the radiation reflected by objects on the ground. That might be light you can see. Or it might be radiation you can't see, such as infrared. Each type of object—a road, a lake, a tree—reflects radiation in its own way. The differences show up as different patterns on Landsat images. Scientists give the patterns different colors. So each kind of object is easy to spot.

Farmers, foresters, miners and conservationists use Landsat information. The people at Ducks Unlimited, a conservation group in Illinois, are using Landsat images to save waterfowl. The maps help the group preserve natural prairie in the Midwest and Canada.

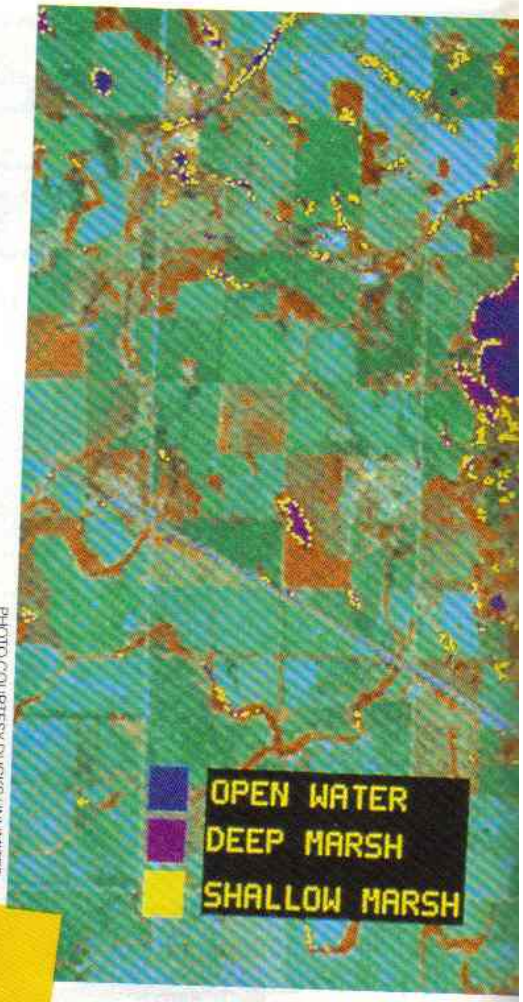
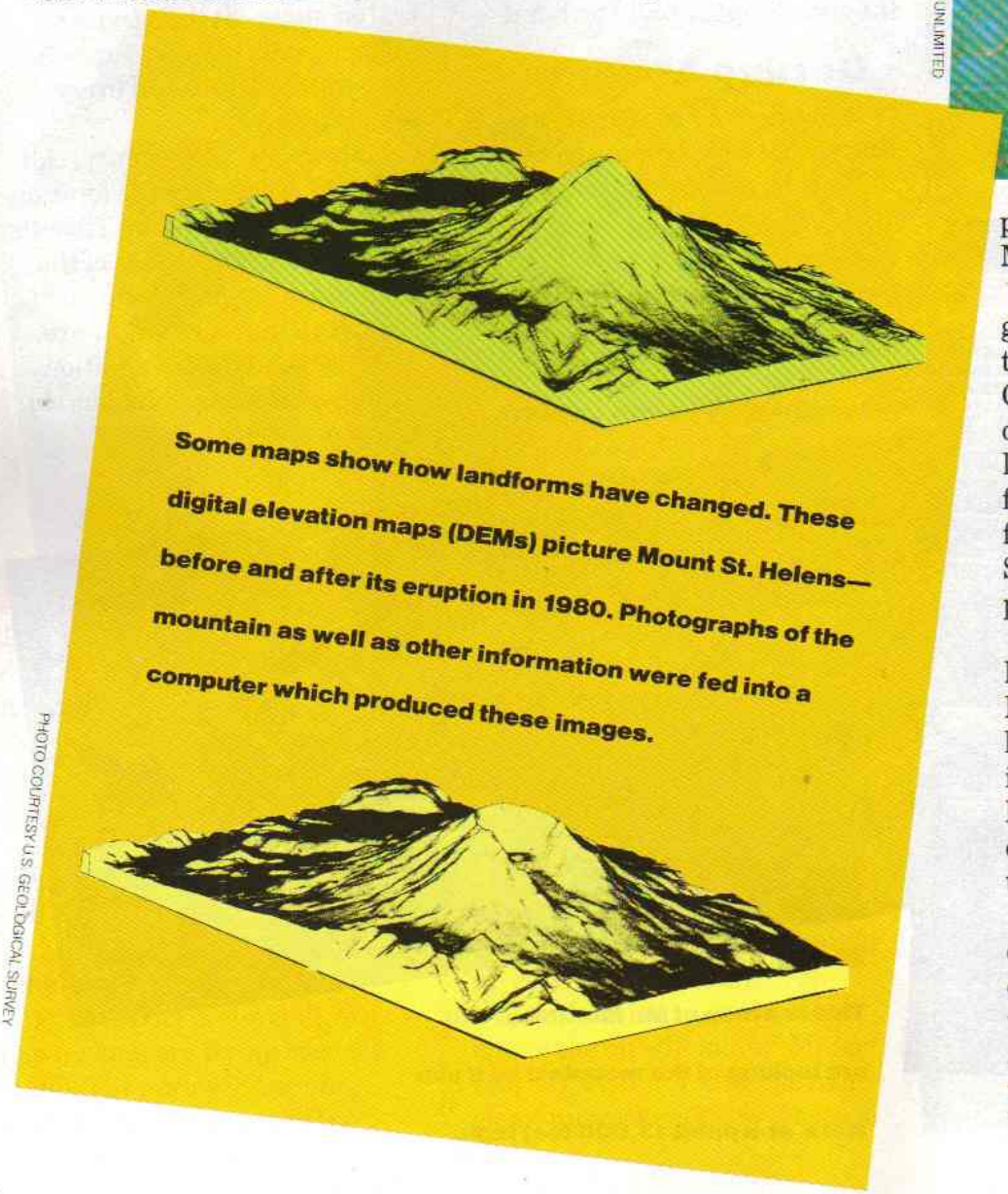


PHOTO COURTESY DUCKS UNLIMITED

"Fifty percent of the ducks and geese in North America breed in the prairie," Greg Koeln told CONTACT. He is a wildlife biologist at Ducks Unlimited. "But a lot of the prairie is being drained for farms. The farmland offers few nesting places for the birds." So they can't breed and their population decreases.

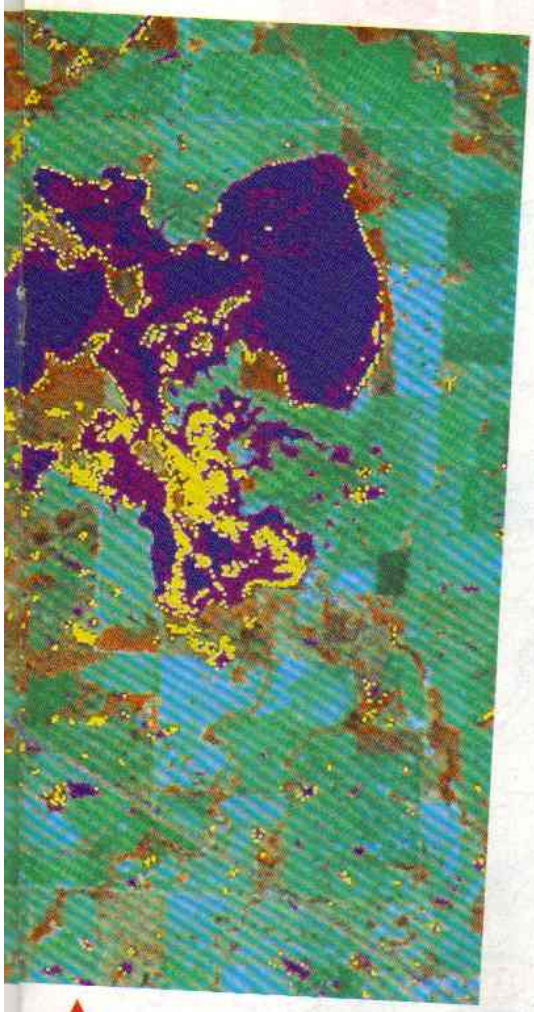
"There are over 10 million wetlands in our study area," says Koeln. "There's no way we could have biologists check each one's importance for ducks and geese. But with satellite images, we've checked on all 10 million in just three years."

Scientists zoom over millions of acres without leaving their chairs. They can see the size of wetlands, how deep the water is and the kind of vegetation nearby. They can see where buildings and highways are get-



Some maps show how landforms have changed. These digital elevation maps (DEMs) picture Mount St. Helens—before and after its eruption in 1980. Photographs of the mountain as well as other information were fed into a computer which produced these images.

PHOTO COURTESY U.S. GEOLOGICAL SURVEY



Maps help people keep track of the breeding grounds of ducks and geese on the prairies of Canada and the U.S.

ting close to breeding areas. So they can concentrate on trying to save these prairies.

Maps in 3-D

Digital elevation maps (DEMs) are another type of map that is increasingly common. DEMs picture Earth's surface as three-dimensional blocks. While other maps have symbols that show mountains, valleys, rivers and so on, DEMs show you the shape of the land—as if you were looking down from an airplane.

DEMs help plan mining, logging and building so that they don't destroy beautiful scenery. For instance, scientists can see how a pipeline would change the look of the countryside—before the pipeline is put in.

But DEMs can also help hide things that either the U.S. government or private companies may not want the public to know about.

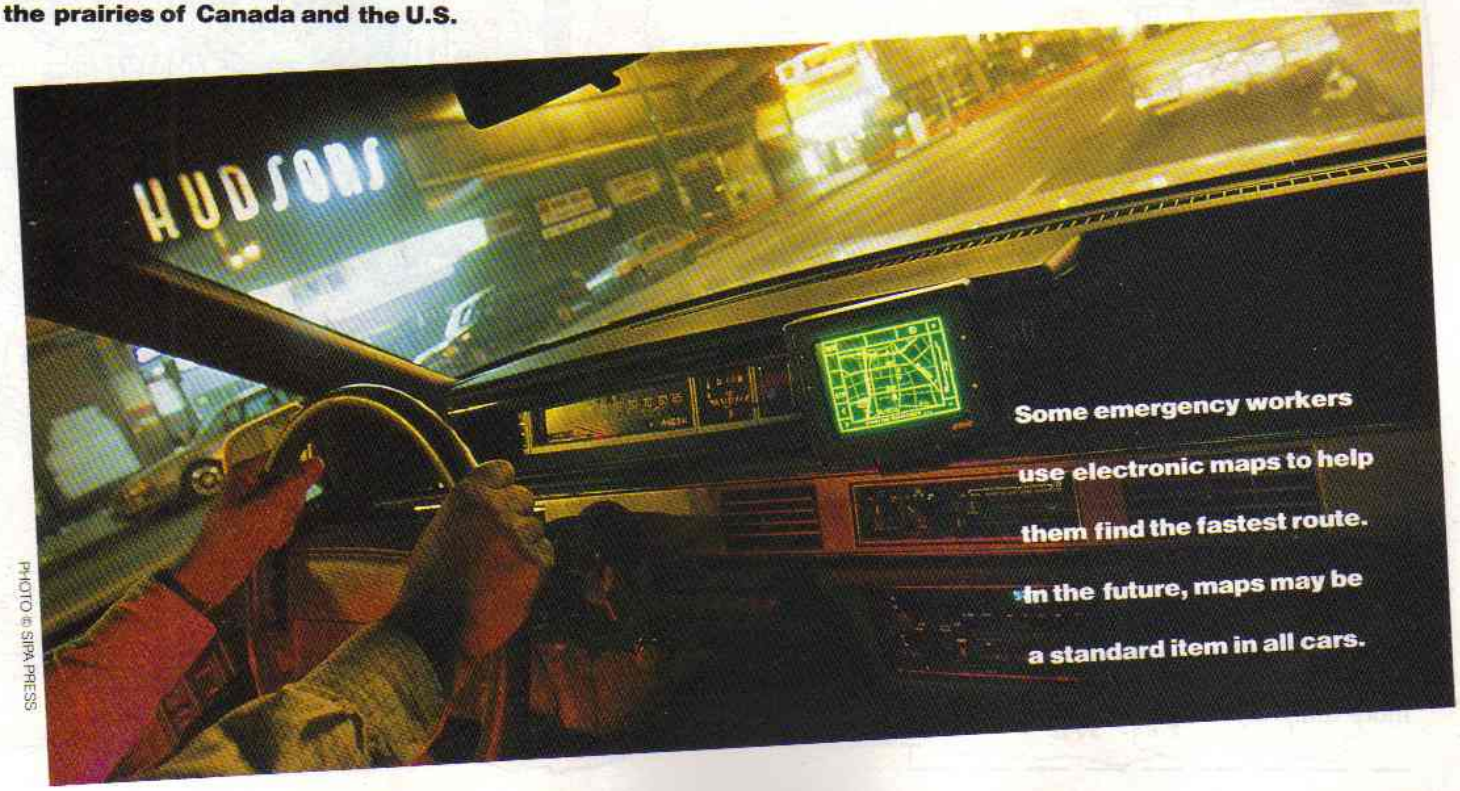
According to one geologist who works for the U.S. government—and who wishes to remain anonymous: "When companies are putting in pipelines or cutting down forests, people get upset if their views are ruined. So you can use a DEM and say, 'If we put the pipeline here or if we cut down these trees, this is what it will look like from a certain highway.'"

Mapping the Future

Computers have brought a revolution to mapping. Chances are someday you will have a computer at home that will be able to make any kind of map for you. And you'll probably have a computer in your car that will show the streets in your area.

One day maps that move—like cartoons—will probably be common. They could show any changes in the land over time.

One company is already putting its road atlas on computer. It will have sound effects and songs for each map it shows. That may sound a bit strange. But saving ducks with maps made by satellites? Fifty years ago, that would have sounded a bit strange, too! ◆



Some emergency workers use electronic maps to help them find the fastest route. In the future, maps may be a standard item in all cars.

PHOTO © SIPA PRESS

ILLINOIS BONES and

I'm Illinois Bones, the adventurer and explorer. I'd faced many challenges in my life, but in front of me was my toughest: a chicken sandwich. It was the toughest chicken I'd ever eaten.

I'd been searching for weeks for the fabled Golden Mask of the Jaguar. But after a lot of digging, I'd only found a lot of dirt. Tossing away the rest of my tough sandwich, I noticed an old map half-buried in the ground.

This was it! I was sure the map would lead me to the Golden Mask. "I'll give the mask to a museum, and become famous," I said to myself. Then I said, "Nahh! I'll sell the mask, and become rich."

I grabbed my shovel, hat, whip and the map, and followed the directions written on the map. Then I wrote in the locations. The letters in the boxes spelled out what the treasure was. But I was too busy digging to figure it out.

As I shoveled, I used my tongue to remove chicken stuck between my teeth. "There must be an easier way to make a living," I said to myself. Then I said to myself, "Gee, I've been talking to myself a lot lately."

These are the directions I found on the map:

1. To find the treasure, start in the Ruins. Travel west for 50 miles until you reach the

_ _ _ _ _ _ _ _ _ _ _.

2. Turn and head north for 50 miles and stop at the edge of the

_ _ _ _ _ _ _ _ _ _ _ _.

3. Go west 50 miles and cross the bridge onto

_ _ _ _ _ _ _ _ _ _ _ _.

4. Travel to the southernmost part of the island and take the tunnel to

_ _ _ _ _ _ _ _ _ _ _ _.

5. Travel west along the coast until you reach a bridge. Cross over into the

_ _ _ _ _ _ _ _ _ _ _ _.

6. Head north 50 miles until you reach the subway station. Take it one stop north and three stops east. Then get out, and travel north for 50 miles. You'll find what you are looking for on the banks of

_ _ _ _ _ _ _ _ _ _ _ _.

I found what I was looking for—but it wasn't the mask. It was even better. It was something I needed more than anything in the world. It was a

_ _ _ _ _ _ _ _ _!

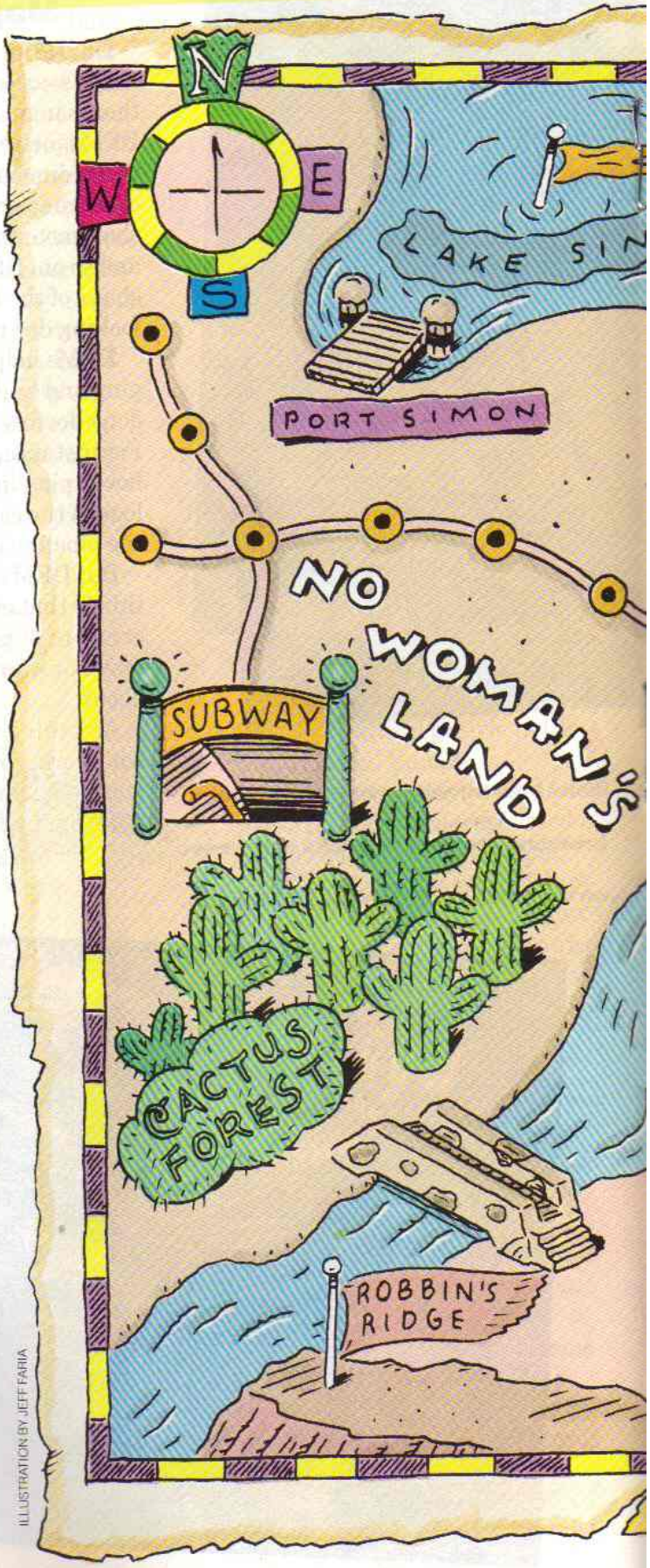
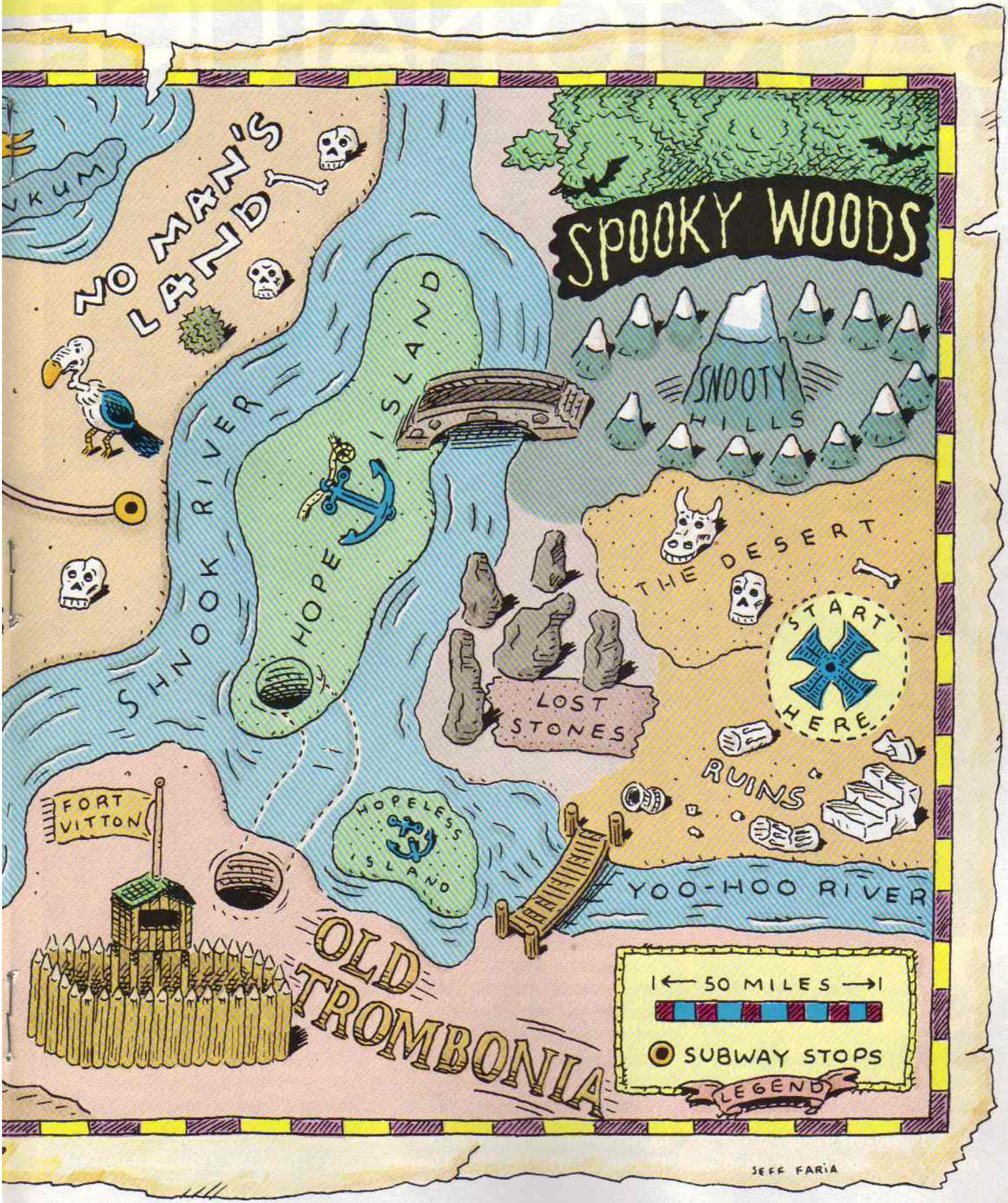


ILLUSTRATION BY JEFF FARIA

the Secret Quest

A CONTACT MAP MYSTERY



SCIENTISTS HELP BACK TO NATURE

by Elizabeth Vitton

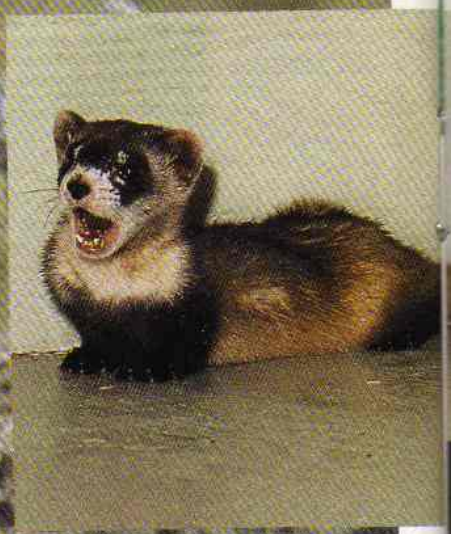


PHOTO © LURAY PARKER/WYOMING GAME & FISH DEPT.

The Sioux Indians have a saying: Killing a black-footed ferret brings bad luck. That may be true. But, until recently, the people who have tried to *save* the ferrets haven't had much luck either. Wildlife experts are now getting the black-footed ferrets–one of the most endangered mammals in North America–ready for a risky reentry into the wild. With luck, the ferrets will be home on the range once again.

In 1900, there were as many as one million ferrets roaming the plains from Canada to Mexico. But, by 1985, the black-footed ferret population fell to 12 animals. The handful of ferrets were rescued and none are now believed to exist in the wild.

What happened? "It's another story of humans competing with animals for land," Chris Wemmer told CONTACT. He works for an animal conservation and research center in Front Royal, Virginia. "Ranchers believed that prairie dogs–

FERRETS RUN WILD

the favorite food of black-footed ferrets–competed with cattle for grass. The ranchers also felt that the holes and tunnels the prairie dogs made were a danger to their livestock. So, with the help of the U.S. government, they poisoned the prairie dogs. This caused the population to fall by as much as 90 percent in some areas." And that meant bad news for ferrets.

"Black-footed ferrets rely on prairie dogs for their survival," wildlife veterinarian Astrid Vargis told CONTACT. She is studying black-footed ferret behavior at the University of Wyoming. The ferrets hunt the rodents in their tunnels and eat them. Then the ferrets use the tunnels for mating, sleeping and raising their young.

There are prairie dogs that still remain on the prairie, but their numbers aren't large enough to support ferrets. "Each adult ferret needs about 125 acres of prairie dog habitat," biologist Brian Miller told CONTACT. "So a 2,500-acre prairie dog colony may hold as many as 10,000 prairie dogs, but only 20 ferrets."

PHOTO © LIRAY PARKER/WYOMING GAME & FISH DEPT.

These black-footed ferret kits will grow to be two feet long and weigh no more than three pounds.

Don Kwiatkowski wears a surgical mask because ferrets can catch a number of diseases from humans.

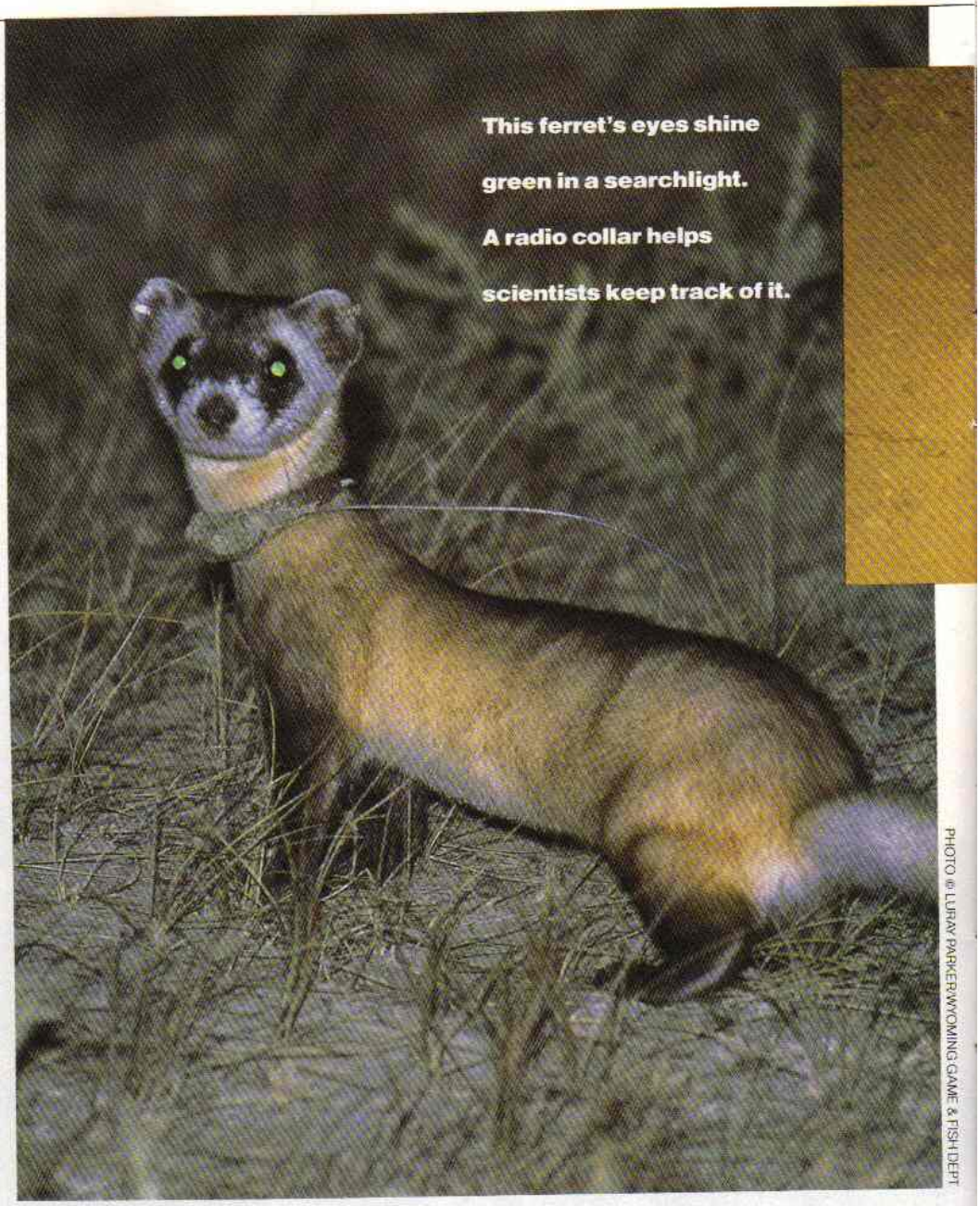
The Dating Game

By the 1980's, wildlife experts only knew of one black-footed ferret colony near Meeteetse, Wyoming. They found 128 ferrets there in 1984, but the population was nearly wiped out by disease the next summer. "We had no choice but to remove the surviving few," explains Miller. "By bringing them into captivity, we could try to rescue them."

A team of experts was sent to breed ferrets in captivity. Their first goal was to increase the numbers of ferrets. But in any captive breeding program, scientists have to be careful to avoid inbreeding, so they don't let the animals mate randomly. "We try to select animals as distantly related as possible," says Dr. Lee Simmons, director of the Henry Doorly Zoo in Omaha, NE. "Our goal is to keep the inbreeding to a minimum."

The breeding program has been wildly successful. "We're off and running!" Dr. Simmons exclaims. "We want to produce a large number of ferrets that can first be sent to other zoos for breeding. Then we'll reintroduce them to their former home ranges."

There's a good chance that the first group of ferrets will return to the wild by the fall of 1991. From a low of 12 animals in 1986, there are now 185 ferrets in captivity. They live in centers ☞



This ferret's eyes shine green in a searchlight. A radio collar helps scientists keep track of it.

PHOTO © LUKAY PARKER/WYOMING GAME & FISH DEPT

in Wyoming, Virginia and Nebraska. "We've kept them in different places to make sure that something horrible, like a fire or a virus, won't wipe out the entire population," says Brian Miller.

Staying Alive

The black-footed ferrets need to prepare for life in the wild. "They need to be able to detect and avoid enemies as well as hunt and kill their own food," says Chris Wemmer. "We want to give them 'boot camp' training for the real world."

To help the weasle-like animals learn, wildlife officials have built outdoor prairie dog colonies in cages. They plan to turn the ferrets loose among the prairie dogs and hope that nature takes its course. "Since no one has reintroduced ferrets before, we don't know how important this is going to be," said Dr. Tom Thorne, the veterinarian who manages the breeding program. "We think it's important, though, for captive-born ferrets just to learn how to live outdoors in prairie dog burrows. Hopefully, they'll even learn how to hunt."

Scientists have been trying to learn as much as possible about black-footed ferrets to make it a happy homecoming. "We know that ferrets move about a mile a night just searching for prey," Astrid Vargis explains. "They need to learn how to explore when they're in captivity so that they can transfer this skill in the wild. We rearrange blocks in their pens every day to shake things up. Moving the 'ferret furniture' keeps them alert and encourages them to explore."

Scientists have also been observing when ferrets develop certain skills. "When the baby ferrets, called kits, are about 40 days old, they begin playing with one another. This playing behavior is very important because they learn how to deliver a neck bite," says Vargis. "About 80 percent of the kits' bites are targeted at the neck. This doesn't hurt because ferrets have a fat pad in the neck to protect them. But we think it teaches the kits a skill they will later need in order to kill prey."

Going to Town

Scientists won't know if any reentry techniques are successful until they actually release

What a "ruff" job! Rosa helps train ferrets to avoid coyotes and other dangers.

PHOTO © B. MILLAR/CONSERVATION & RESEARCH CENTER

PHOTO © LURAY PARKER/WYOMING GAME & FISH DEPT.

It's dinner time! Ferrets get a meal of mink, prairie dog, freeze-dried liver and vitamins.

PHOTO © LURAY PARKER/WYOMING GAME & FISH DEPT.

To keep human contact to a minimum, scientists watch ferrets through a TV monitor.

the ferrets into the wild. "We plan to release 25 males and 25 females in Wyoming near their original colony," wildlife veterinarian Don Kwiatkowski told CONTACT. "We are expecting high losses. In the wild, 80 percent of all ferrets don't survive. Nature is a tough master. We expect to lose even more, since these animals have been born in captivity."

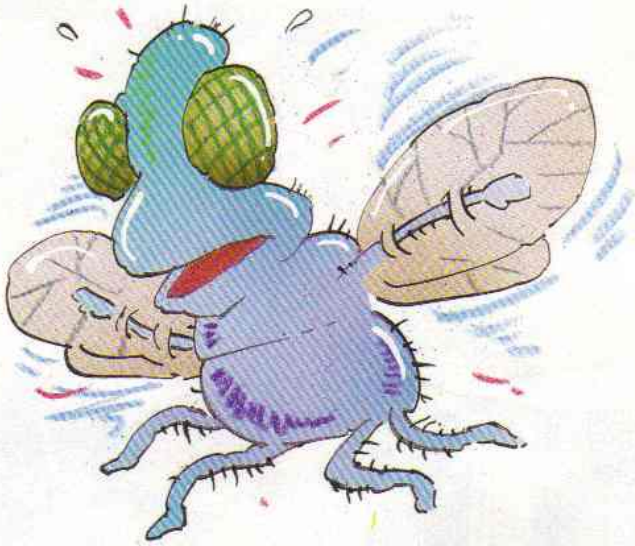
When the ferrets are released in the middle of a prairie dog colony, some will wear radio collars to help the scientists monitor their behavior. There are plans to have nesting boxes available to help the animals adjust to their new environment.

"The ferret can return here for safety and rest. We'll also provide them at first with some food to supplement their diet," says Kwiatkowski. "We don't know how ferrets are going to respond. We hope they'll eventually abandon the boxes and live permanently in the prairie dog town."

The ferrets' future in the wild is uncertain. Only time will tell whether the lone rangers of the prairie can survive the odds. But with any luck, zoos won't be the last place on Earth where the wild things are. ◆

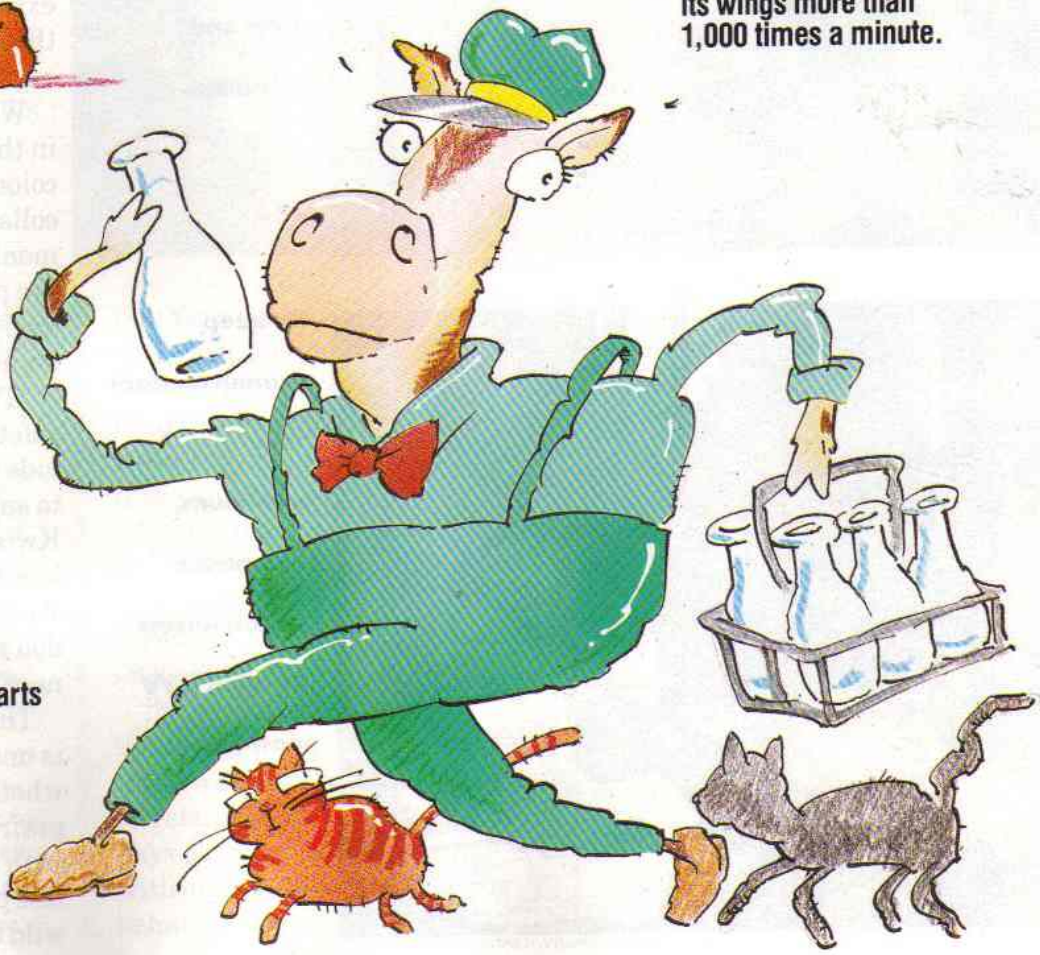
FACT

ILLUSTRATIONS BY CHARLES PEALE



A housefly can flap its wings more than 1,000 times a minute.

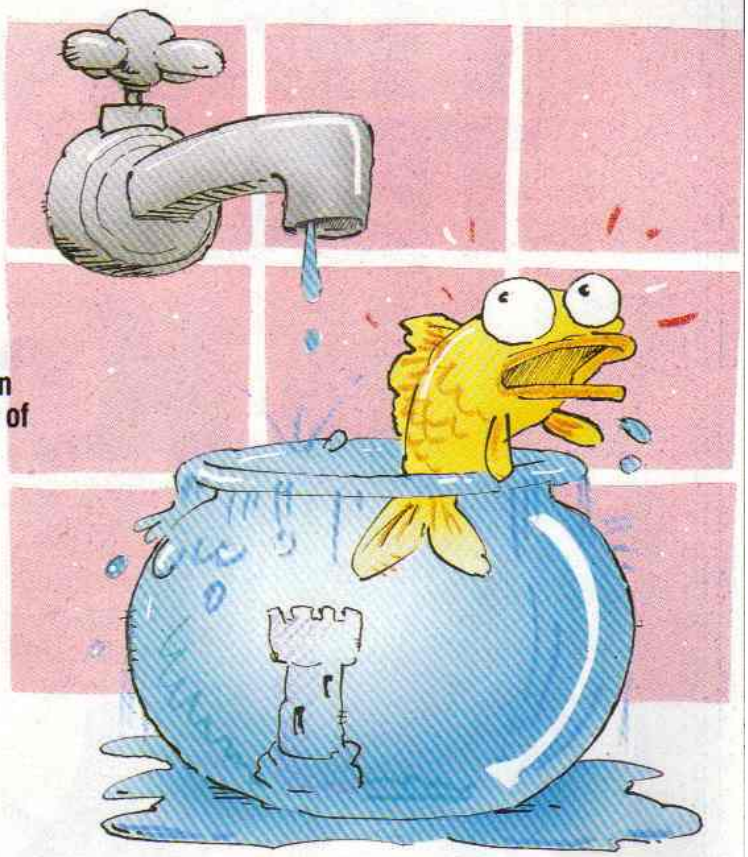
It would take 400,000 full moons shining at once to light up the Earth as much as the sun does.

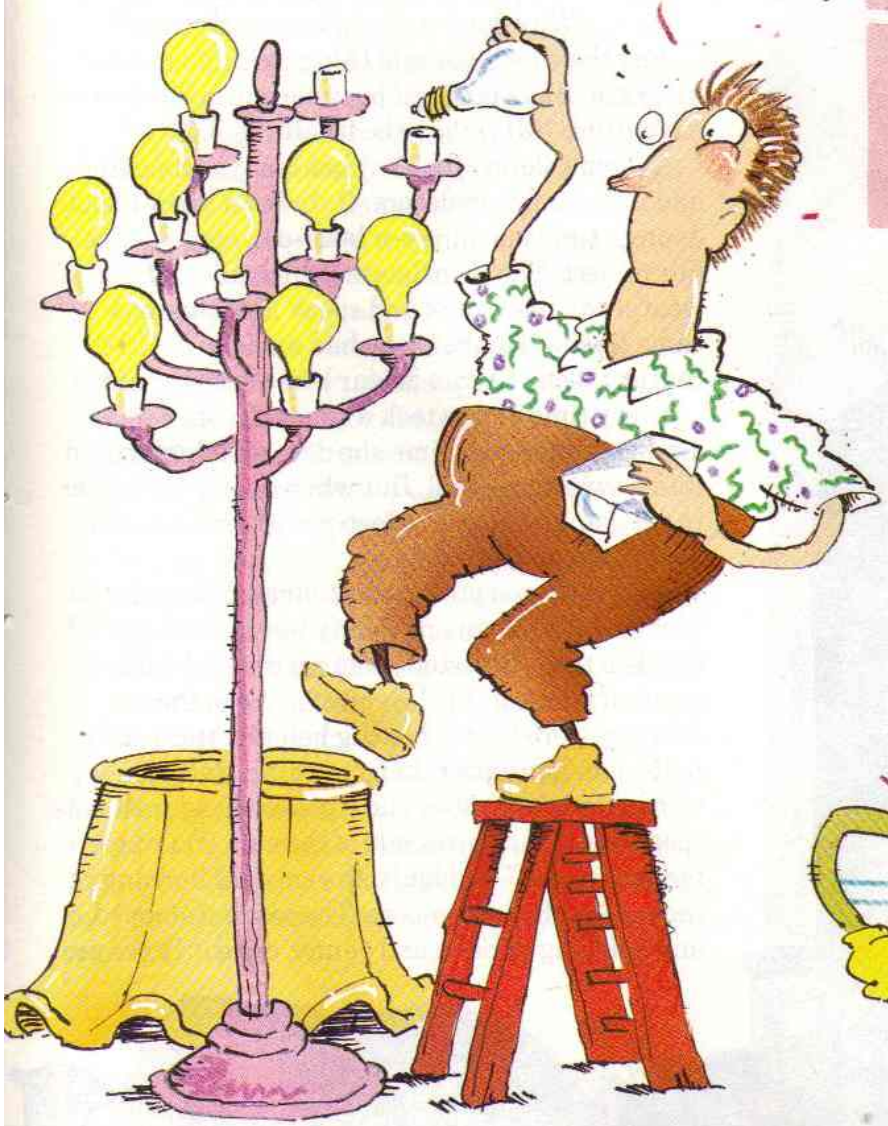


The average dairy cow makes about 4,000 quarts of milk each year.

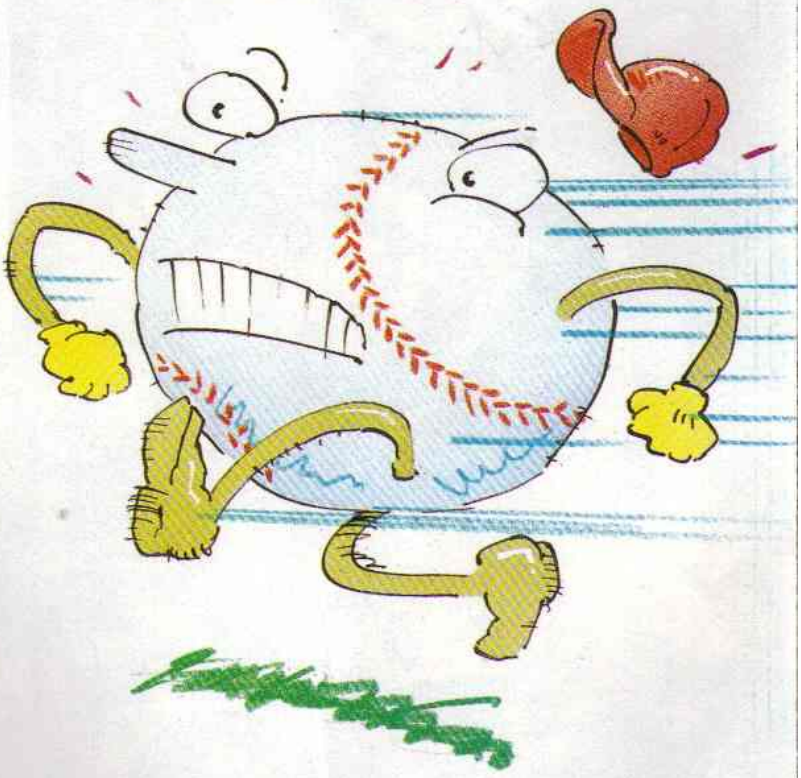
OIDS

A small drip from a leaky faucet can waste 50 gallons of water each day.





Every year, Americans buy more than one billion light bulbs.



A fastball reaches home plate in less than a half second.

THE TIME TEAM

The King and I

by Curtis Slepian

"Vote for Sean Nolan!" read the poster in the high school hallway.

To everyone's surprise, Sean was running—and running hard—for student body president. He was handing out campaign leaflets when Jenny Lopez passed. "Voting for me?" he asked.

Jenny shook her head. "I wouldn't feel safe with power in your hands."

"Handling power is a snap," he said.

As she walked away, Jenny said, "I predict you'll get one vote—your own!"

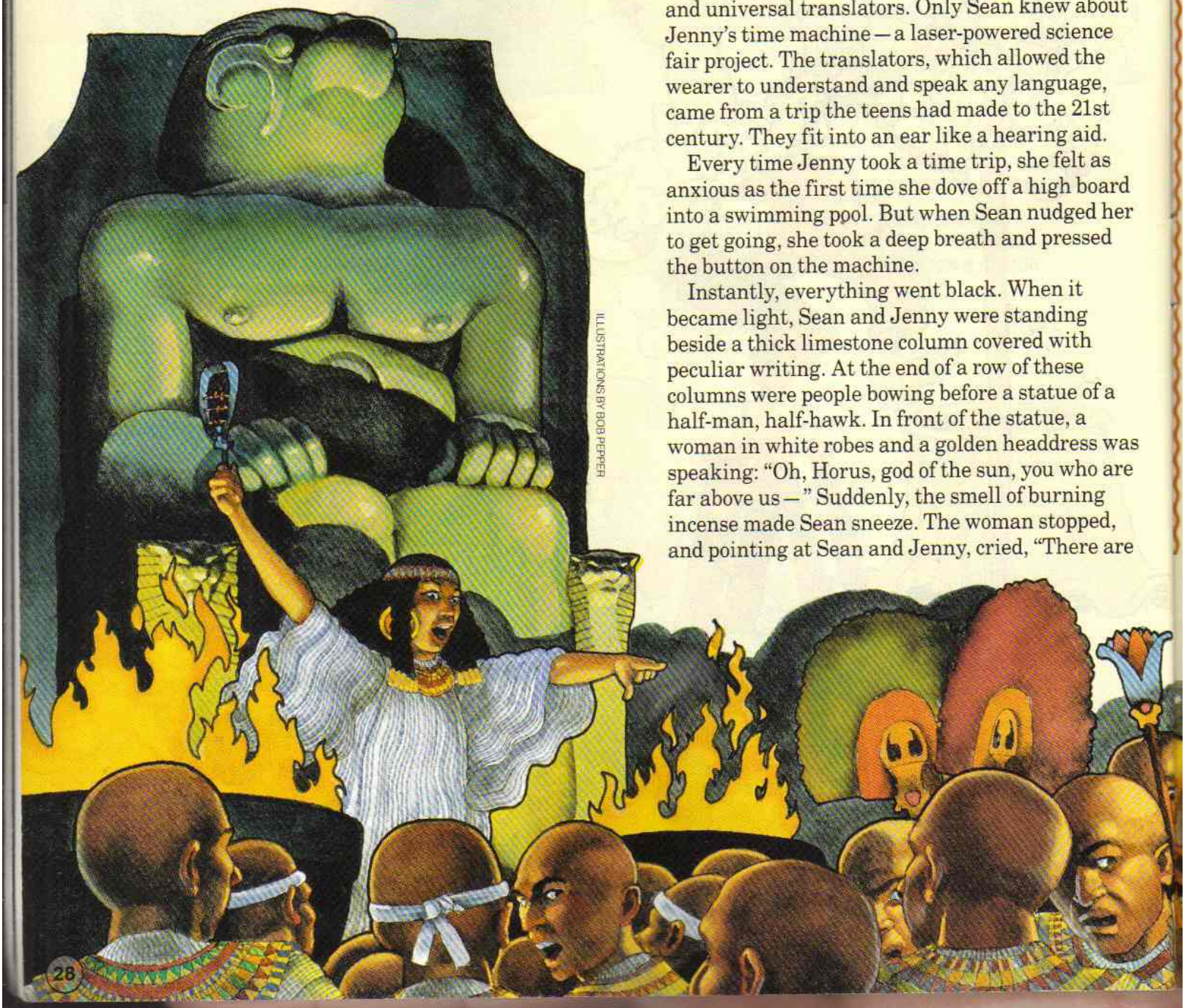
Sean ran up alongside her: "I've been campaigning so hard, I need a vacation. Why don't we boogie through time?"

Just the way Sean said things got under Jenny's skin. But...it *would* be fun to go on another adventure. "All right," she finally said.

At home, Jenny took out her tachyon machine and universal translators. Only Sean knew about Jenny's time machine—a laser-powered science fair project. The translators, which allowed the wearer to understand and speak any language, came from a trip the teens had made to the 21st century. They fit into an ear like a hearing aid.

Every time Jenny took a time trip, she felt as anxious as the first time she dove off a high board into a swimming pool. But when Sean nudged her to get going, she took a deep breath and pressed the button on the machine.

Instantly, everything went black. When it became light, Sean and Jenny were standing beside a thick limestone column covered with peculiar writing. At the end of a row of these columns were people bowing before a statue of a half-man, half-hawk. In front of the statue, a woman in white robes and a golden headdress was speaking: "Oh, Horus, god of the sun, you who are far above us—" Suddenly, the smell of burning incense made Sean sneeze. The woman stopped, and pointing at Sean and Jenny, cried, "There are



ILLUSTRATIONS BY BOB PEPPER

intruders in our temple. Seize them!"

Rough hands led the bewildered teens through an amazing city of vast temples, giant stone pillars and huge statues of men and animals. Beyond the city and its palm trees stretched a desert.

"What's the name of this town?" Sean asked.

"Thebes, sacred city of Tutankhamen."

Tut, Tut

"King Tut!" exclaimed Jenny. "He was the pharaoh of Egypt more than 3,000 years ago."

"If I'd known we'd end up in Egypt," said Sean, "I'd have brought along sunscreen."

The teens were taken to the pharaoh's palace, where a bald-headed priest said, "These strangely dressed foreigners are spies. Now they shall be our slaves. Make them clean the courtyard."

After an hour raking the sandy ground, Sean said, "This is worse than mowing my dad's lawn. Let's play tic-tac-toe in the sand." As they played, a man and a young boy walked past.

"Let me play," commanded the boy.

Sean didn't like his tone and decided to teach him a lesson. After explaining the rules, Sean beat the kid 12 straight games.

The man said, "Tutankhamen, shall I have these slaves clean out the royal cesspool?"

The kid was King Tut!

"No, Ay," Tut said. "All the people I play games with lose to me on purpose. I have no real friends because people are afraid of me. But these two aren't afraid. I want them as my personal slaves."

"But Pharaoh..." said Ay.

Tut said to Sean and Jenny, "Ay, my advisor, tries to push me around because I'm so young. But I'm king of the world."

Under the ever-watchful eye of Ay, the three kids spent the whole day playing games: spinning tops with papyrus string, juggling clay balls, playing piggy back.

"This is great," said Tut. "I never get to play with mortals my own age."

"Well, I *am* a year older than you," said Sean. "But you're pretty cool for 14."

That evening, the two teens watched Tut and Ay discuss the problems of the kingdom, with Ay doing most of the talking.

Sean whispered to Jenny, "I could handle Tut's job easily."

While everyone relaxed, Sean told knock-knock jokes. The pharoah giggled. "Sean, for making me laugh, I'm placing you in charge of the royal slaves. That was one of Ay's duties."

Jenny got angry: "Sean, slavery is terrible. You shouldn't order anyone around."

"Oh, Jenny, chill. I mean, don't slaves get free room and meals?"

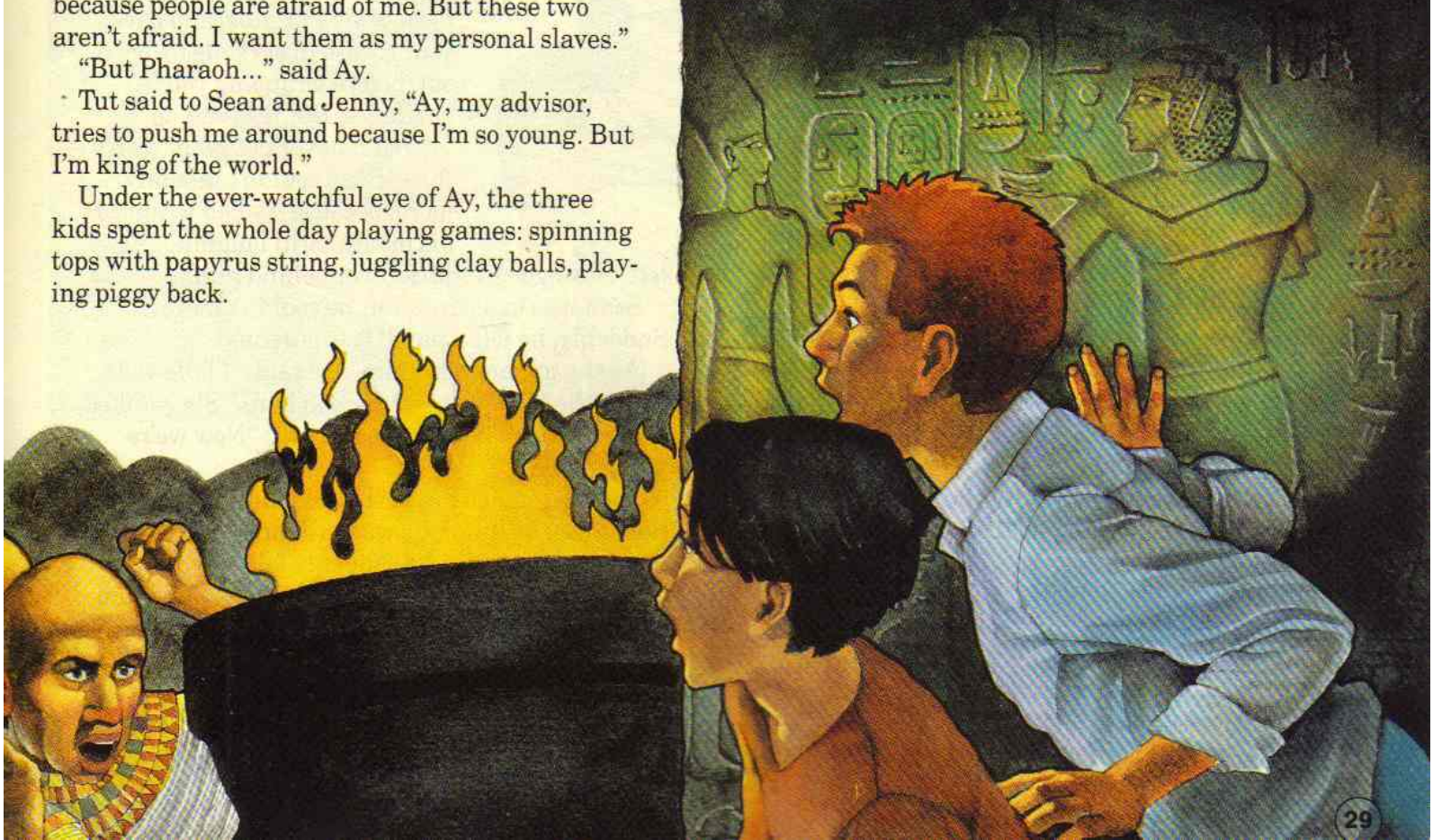
"Congratulations, Sean," said Ay, smiling.

The next day, Sean toured Thebes. As he walked near a building, he slipped on some sand. The next instant, a stone statue falling from a great height crashed right in front of him. If he hadn't slipped, he'd have been crushed!

Sean described the accident to Jenny, who took the tachyon machine from her pocket: "Let's leave. This place isn't safe for us."

Sean grabbed the machine from her. "We'll go when I feel like it. And I don't feel like it."

The teens didn't speak to each other for a ☞



week. Then, one evening, Sean, Jenny, Tut and Ay went out sailing on the Nile River.

As Ay began to advise Tut to wage war against Persia, Sean broke in: "Tut, try lining up your chariots close to the Persian border. Just the threat will force them to make peace and no one will be killed."

Tut said, "Sean has some good ideas."

Ay agreed: "A most intelligent slave."

Later, Sean leaned against the side of the boat to gaze at the shore. Without warning, one of the sails struck him, knocking him overboard. Stunned, Sean just managed to swim to the surface and call for help.

Quickly, Jenny and Ay rushed over and pulled him back in. Tut said, "You should watch your step at all times, Sean."

Curse of The Mummy?

Alone with her shivering classmate, Jenny said, "You've nearly been killed twice."

"Maybe it's the curse of the mummy," laughed Sean weakly.

"Maybe you hang around Tut too much. You're in over your head."

Sean ignored her. He was having too much fun with Tut. He even made up a rap song about the king. As a reward for the song, the king presented Sean with a gold ring.

"High five," said Sean happily, raising his right hand to the pharaoh. Tut missed Sean's hand once or twice, before he got the hang of it.

Ay ran over and said, "Sean, teach me that wondrous hand gesture."

Back in Sean's room, Jenny wasn't impressed by the ring—she still wanted to go home. As they argued, Ay's pet baboon reached into a bowl of figs the teens were planning to eat. Moments later, the baboon collapsed. It was dead!

Fear gripped Jenny: "One of the figs was poisoned. Someone is trying to kill you, Sean."

"Nothing can happen to me," he said grimly. "I'm tight with Tut."

Then, a week later, Jenny was ordered into Sean's chambers. He was dressed like an Egyptian, with gold chains hanging from his neck.

"Bow down, Jenny. You're in the presence of Tut's new second in command! I'm going to replace Ay. I'll make history."

"Sean, you've been in the sun too long. We've got to get back to the 20th century."

"No, I've got great plans here. I'm gonna have a pyramid built and it'll be named after me. And then I'm gonna conquer the known world. And then I'm gonna—"

That moment, a worried-looking Ay burst into the room: "Tut believes he's given you too much power. He is trying to get rid of you! I will show you proof at the Valley of the Kings. Meet me there tomorrow."

"I knew that punk was jealous!" said Sean.

Early next morning, against Jenny's advice, Sean rode a camel to the Valley of the Kings, a place where the pharaohs were buried. Ay was standing at an opening in the side of a cliff. A second after Sean walked through the opening, he got hit on the head. When Sean awoke, he was inside a coffin, bound up to the neck in linen bandages. Standing above him was Ay!

"So it was you all along," said Sean.

Ay smiled. "Yes, you have become too powerful. When I get rid of Tut, I will be pharaoh.

"You, on the other hand, will be a mummy. Ordinarily, we'd wait for you to die a natural death. Then I'd first remove most of your organs, and pack your corpse in crystals to dry it out, before wrapping you in bandages. But this will do."

"You'll never get away with th—" Sean couldn't talk any more, because Ay had wrapped his mouth. Still laughing, Ay left, closing the tomb forever behind him.

Sean was in a panic, but he couldn't move. Suddenly, he felt a hand! It was Jenny!

As she unbandaged him, she said, "I followed you to the Valley, then snuck in here." She yanked the time machine from Sean's belt: "Now we're going home."

"No!" screamed Sean. "I have plans." But the next thing he knew, he was in Jenny's room. In his Egyptian outfit, he suddenly felt silly.

"I guess the power went to my head," Sean said sheepishly. "I don't think I'm quite ready to run a country—or even a high school."

The next day, Sean took his name off the ballot for class president. Only Jenny knew why, but she wasn't telling. ◆

MATHNET DETECTIVE PAGE

LEFTY OR RIGHTY?

Study the four objects below. Can you tell which ones were used by a left-handed person or a right-handed person?

ILLUSTRATION BY ANNIE GUSMAN

ROAD RIDDLE

A police officer was walking home after work. There was no moon out. He wore his dark uniform and the narrow road had no street lights. A car with broken headlights swerved and just missed him. Why did the driver avoid hitting the officer?

MATH TRICKS TO A

By Marvin Miller

★GADZOOKS! YOU KNEW IT!★

Hand a friend a sealed envelope. Have him or her choose four numbers. Abracadabra! The total of the numbers is written on a paper inside the envelope!

What you'll need:

- This magic chart
- Four nickels
- Twelve pennies
- An envelope, paper and a pencil

What to Do:

1. Tell your friend to place a nickel over any number on this chart. Then cover all the numbers in the same row and column with pennies.
2. Tell your friend to place a nickel on any number that isn't already covered. As before, cover all the numbers in the same column and row with a penny.
3. Repeat with a third nickel. Again, cover up the other numbers in the row and column.
4. Place the last nickel on the remaining number.
5. Have your friend add up the numbers under the nickels. Then have him or her open the envelope–you already knew the answer!

The Secret:

The total will always be 37.

GIG

AMAZE YOUR FRIENDS

When in Rome...

IX

Ask a friend to draw just one line that will turn this roman numeral nine into a six.

When your friend gives up, you show how it's done! The solution is on the Did It page.

CALC-U-LATER, ALLIGATOR!

Tell two people that you can guess the total of four numbers they will enter into a calculator. Let's call these people "A" and "B." Turn your back and have them follow these instructions:

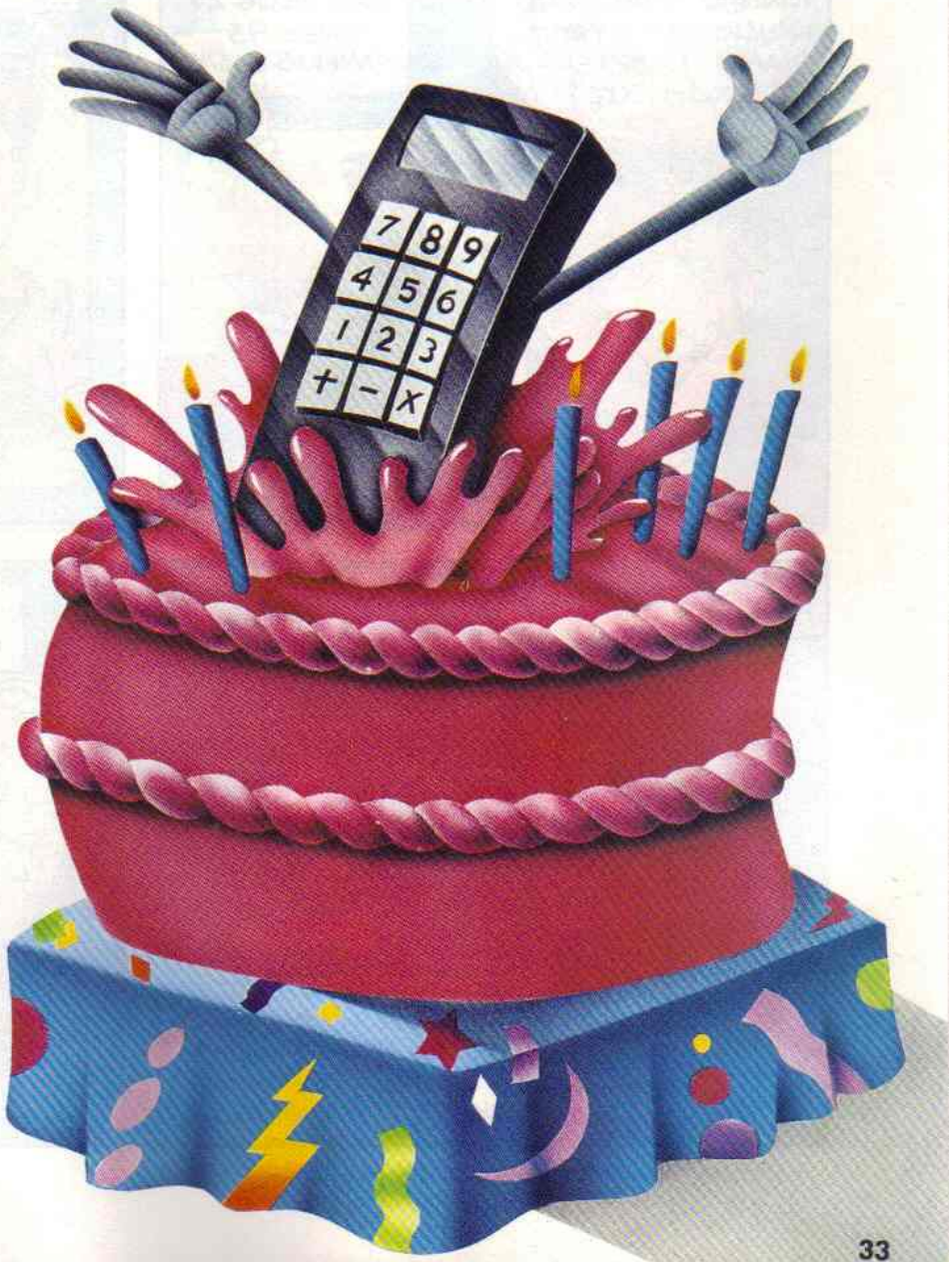
1. "A" enters his year of birth into the calculator and then presses the (+) button.

2. "B" enters her year of birth, and presses the (+) button.

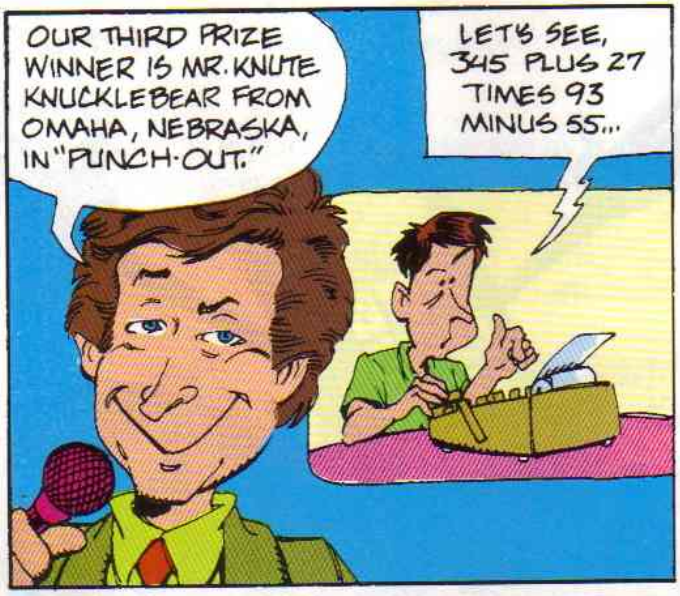
3. "A" enters what his age will be on the last day of this year and presses the (+) button.

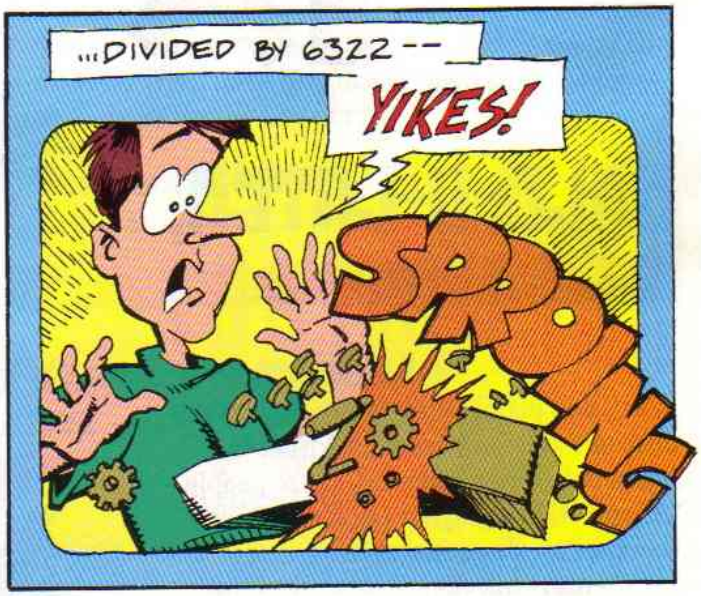
4. "B" enters what her age will be on the last day of this year and presses the (+) button.

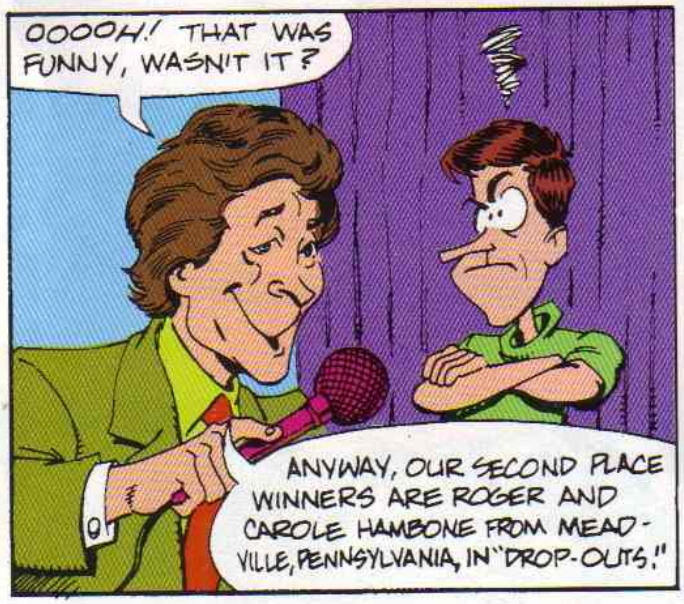
With your back still turned, you announce the total on the calculator. *"It is 3,982."* (Just take whatever year it is—1991 right now–and multiply by two.)

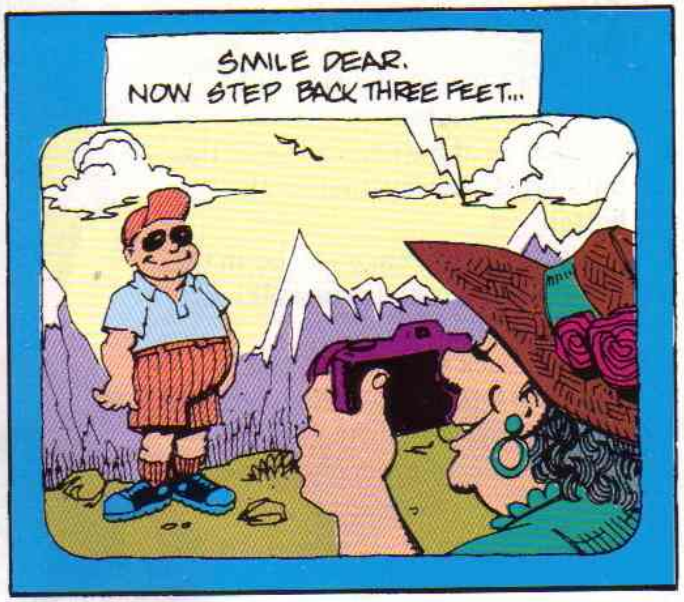



AMERICA'S PHONIEST MATH VIDEOS
A SQUARE ONE PUZZLE!
STORY RUSSELL GINNS
ART KEITH WILSON
HI, I'M BOB SLAGPIT AND WELCOME BACK TO AMERICA'S FUNNIEST MATH VIDEOS. IT'S TIME TO ANNOUNCE TONIGHT'S WINNERS.


OUR THIRD PRIZE WINNER IS MR. KNUTE KNUCKLEBEAR FROM OMAHA, NEBRASKA, IN "PUNCH-OUT."
LET'S SEE, 345 PLUS 27 TIMES 93 MINUS 55...

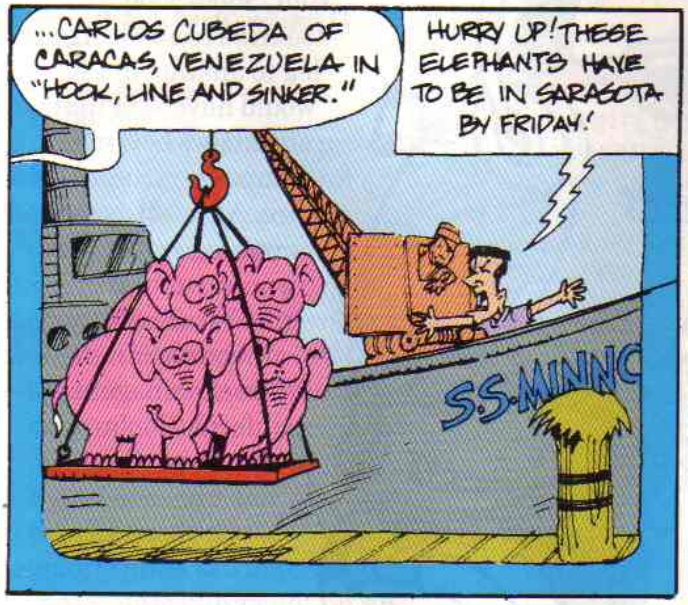

...DIVIDED BY 6322 --
YIKES!
SPROING


OOOOH! THAT WAS FUNNY, WASN'T IT?
ANYWAY, OUR SECOND PLACE WINNERS ARE ROGER AND CAROLE HAMBONE FROM MEAD-VILLE, PENNSYLVANIA, IN "DROP-OUTS."


SMILE DEAR. NOW STEP BACK THREE FEET...


YEAAAAHH!
I MEANT INCHES!


HEE HEE!
AND NOW THE MOMENT YOU'VE ALL BEEN WAITING FOR, OUR GRAND PRIZE WINNER...
Hmmph.
Mmmph.


...CARLOS CUBEDA OF CARACAS, VENEZUELA IN "HOOK, LINE AND SINKER."
HURRY UP! THESE ELEPHANTS HAVE TO BE IN SARASOTA BY FRIDAY!
S.S. MINNO


BUT THE BOAT WON'T FLOAT WITH MORE THAN 20,000 POUNDS OF CARGO.
NO PROBLEM. THESE ELEPHANTS WEIGH FIVE TONS EACH...
WE'LL HAVE 50,000 POUNDS TO SPARE.


SPLOOSH
Heh. Heh.
TEE HEE.
NYUCK
HAH!
I DON'T GET IT...
WHAT'S SO FUNNY ABOUT THE WINNING VIDEO? CAN YOU SPOT CARLOS'S MATH ERROR?
ANSWER ON THE DID IT PAGE.

THE SLIPPED Disk SHOW

Howdy, hackers! It's me, Slipped Disk, back with another show. Not only am I a world-famous computer expert, I'm also the fastest computer expert in the world. (Of course, my dog, Floppy, can answer questions faster than I can, but he uses four legs instead of two.)

I'm so fast that most of the time I don't even have to hear the question to answer it. For example: Yes. No. Maybe. But every now and then, one makes me slow down. Like this one, from **Michael Shattuck,** 10, of Baltimore, Maryland. Michael asks:

"Why is static electricity bad for computers?"

Michael, I have to admit that electricity is faster than I am, even though I have been known to shock people once in a while. Ouch! (Floppy bites my leg whenever he doesn't like one of my jokes.) Anyway, the microchips inside a computer are very delicate. The circuits are very tiny, and sudden charges of electricity, including static charges, could damage them. Static causes the shocks you get when you rub your feet on the rug and then touch someone else. But don't worry, most computers are designed to protect their circuits from static electricity during normal use.

I hope that answer wasn't too shocking, Michael, but now I have to rush on to the next question, which is from **Heather Hawthorne** of Sylacauga, Alabama. Heather wants to know:

"What is LOGO?"

ILLUSTRATION BY CAMERON EAGLE

Heather, LOGO has played an important part in our country's history. In fact, Abraham Lincoln was born in a logo cabin. Ouch! Okay, okay, LOGO is a computer language often used to teach programming to beginners.

One special feature of LOGO is its drawing commands, such as RIGHT 90, which means go right 90 degrees. These commands are used to move the cursor around the screen, but in LOGO, the cursor is called a turtle. Sometimes the computer is hooked to a small robot "turtle" that can draw designs on paper.

However, turtles are too slow to answer this next question. I need a dog! That's because this one is addressed to Floppy. It says here it's from a miniature doberman pinscher named **Shou-Shou** in Richardson, Texas. (I think Shou-Shou had some help from her owner, **Mary Loung.**) Anyway, Shou-Shou asks:

"Floppy, how many computer viruses are there?"

Well, Shou-Shou, Floppy is too tired from biting my leg to answer, but he would have said that no one knows how many computer viruses there are. After all, computer viruses are just programs written by people. Viruses can wreck other programs and do lots of damage to the information in your computer. But you don't have to worry much about viruses if you use mainly game disks and other programs you bought in a store.

And that's all for this month. We'll be back before you know it with another show. Until then, if you have any computer questions, send them to me (or Floppy) at:

BASIC TRAINING

Programs For Your Computer

COMET CATCHER

For IBM, Apple II and Commodore 64 computers

With this program, you control a spacecraft trying to catch a passing comet. Fire your rockets to move up and to the right. To slow down, you'll need to fire your rockets in the opposite direction. You are the asterisk (*). The comet is the pound sign (#). Try to meet the comet in as few moves as possible.

This program is written for the IBM PC. To run it on an Apple II, leave out line 10, change line 20 to **FL = 1** and change all **CLS** statements to **HOME**. For Commodore 64 computers, leave out line 10, change line 20 to **FL = 3** and change all CLS statements to **PRINT CHR$(147).**

```
10  RANDOMIZE (TIMER)
20  FL = 2
30  GOSUB 390
40  GOSUB 420
50  IF (ABS(BX–CX)<100) AND
    (ABS(BY–CY)<100) THEN 220
60  IF CX<100 OR CY>2000 THEN
    190
70  GOSUB 250
80  PY = 23: PX = 1
90  ON FL GOSUB 510, 500, 520
100 INPUT "RIGHT THRUST (–10 TO
    10):";TX
110 IF TX<–10 OR TX>10 THEN 80
120 TX = TX*4
130 PY = 24: PX = 1
140 ON FL GOSUB 510,500,520
150 INPUT "UP THRUST (–10 TO
    10):";TY
160 IF TY<–10 OR TY>10 THEN 140
170 TY = –TY*4
180 GOTO 40
190 CLS: PRINT "COMET OUT OF
    RANGE!"
200 PRINT "BETTER LUCK NEXT
    TIME!"
210 END
220 CLS: PRINT
    "CONGRATULATIONS! YOU
    ARE IN ORBIT!"
230 PRINT "YOU MADE IT IN "T"
    MOVES."
240 END
250 CLS
260 PY = 21: PX = 1
270 ON FL GOSUB 510,500,520
280 PRINT "DISTANCE:
    INT(CX–BX)" RIGHT "
    INT(BY–CY)" UP"
290 PY = 22: PX = 1
300 ON FL GOSUB 510,500,520
310 PRINT "CURRENT SPEED:
    (YX/4)" RIGHT "(–YY–4)"UP"
320 PX = INT(CX/100): PY = INT
    (CY/100)
330 ON FL GOSUB 510,500,520
340 PRINT "#"
350 PX = INT(BX/100): PY =
    INT(BY/100)
360 ON FL GOSUB 510,500,520
370 PRINT "*"
380 RETURN
390 CX = 4000: CY = 800*RND (1):
    VX = –(100–(50*RND(1))): VY =
    20–(10*RND(1)): T = 0
400 BX = 100: BY = 2000: TX = 0:
    TY = 0
410 RETURN
420 T = T+1: CX = CX+VX: CY =
    CY+VY
430 BX = BX+.5*TX+YX: YX =
    YX+TX
440 IF BX<100 THEN BX = 100
450 IF BX>3900 THEN BX = 3900
460 BY = BY+.5*TY+YY: YY =
    YY+TY
470 IF BY>2000 THEN BY = 2000
480 IF BY<100 THEN BY = 100
490 RETURN
500 LOCATE PY,PX: RETURN
510 HTAB PX: VTAB PY: RETURN
520 PRINT CHR$(19);
530 FOR J = 2 TO PX: PRINT
    CHR$(29);:NEXT
540 FOR J = 2 TO PY: PRINT
    CHR$(17);:NEXT
550 RETURN
```

ILLUSTRATION BY MARTIN LEMELMAN

SEND US YOUR PROGRAMS

If you've written a program you'd like us to print, send it in. If we like it, we'll print it and send you $25. Include a note telling us your name, address, age, T-shirt size and type of computer.

All programs must be your own original work. We cannot return programs. Please do not send discs.

Send your programs to:

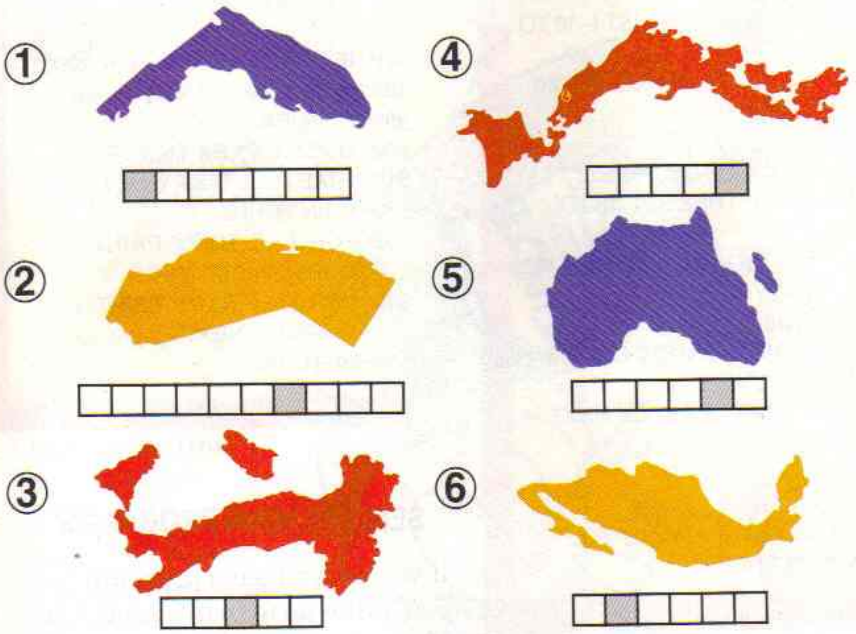
EXTRA!

by Russell Ginns

CARTOGRAFFITI
A Geography Contest

First Prize:
A Rand McNally World Atlas!
Second Prize:
A CONTACT T-shirt!

How To Solve The Puzzle:
We've taken maps of some famous places and messed them up. Can you identify the six states, countries or continents? Write the name of each place in the boxes below it.



How To Enter Our Contest:
The shaded letters of each answer will spell out the name of a country. Write that name on a piece of paper and mail it to:

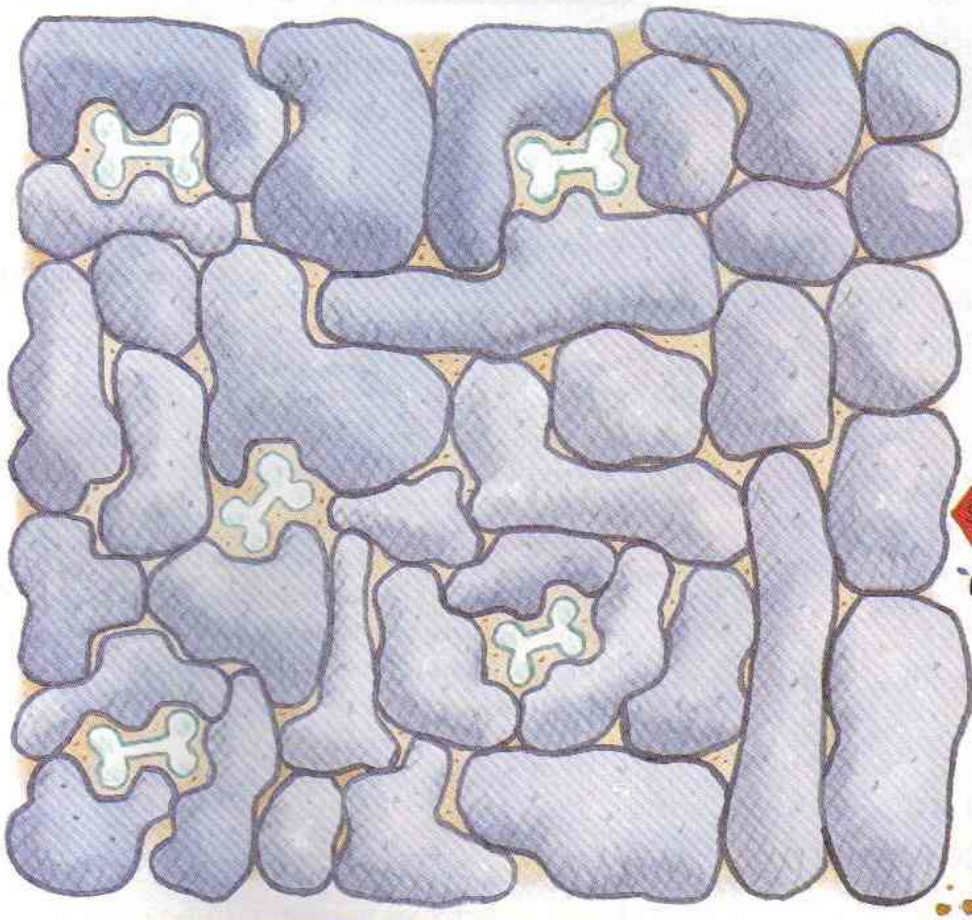
Geography Contest
3-2-1 CONTACT Magazine
P.O. Box 40
Vernon, NJ 07462

We'll randomly draw a winner from all of the correct answers. The first-prize winner will get a deluxe Rand McNally world atlas. Five second-place winners will get their very own 3-2-1 CONTACT T-shirts. All entries must be mailed by January 15, 1991.

CHIP OFF THE OLD ROCKS

Take part in our fossil hunt! Clear away the rocks so you can draw a clear path from the Earthwatch crew to all five mammal bones. Here's the catch: You can only remove a total of nine rocks.

The answer is fossilized on the Did It page.

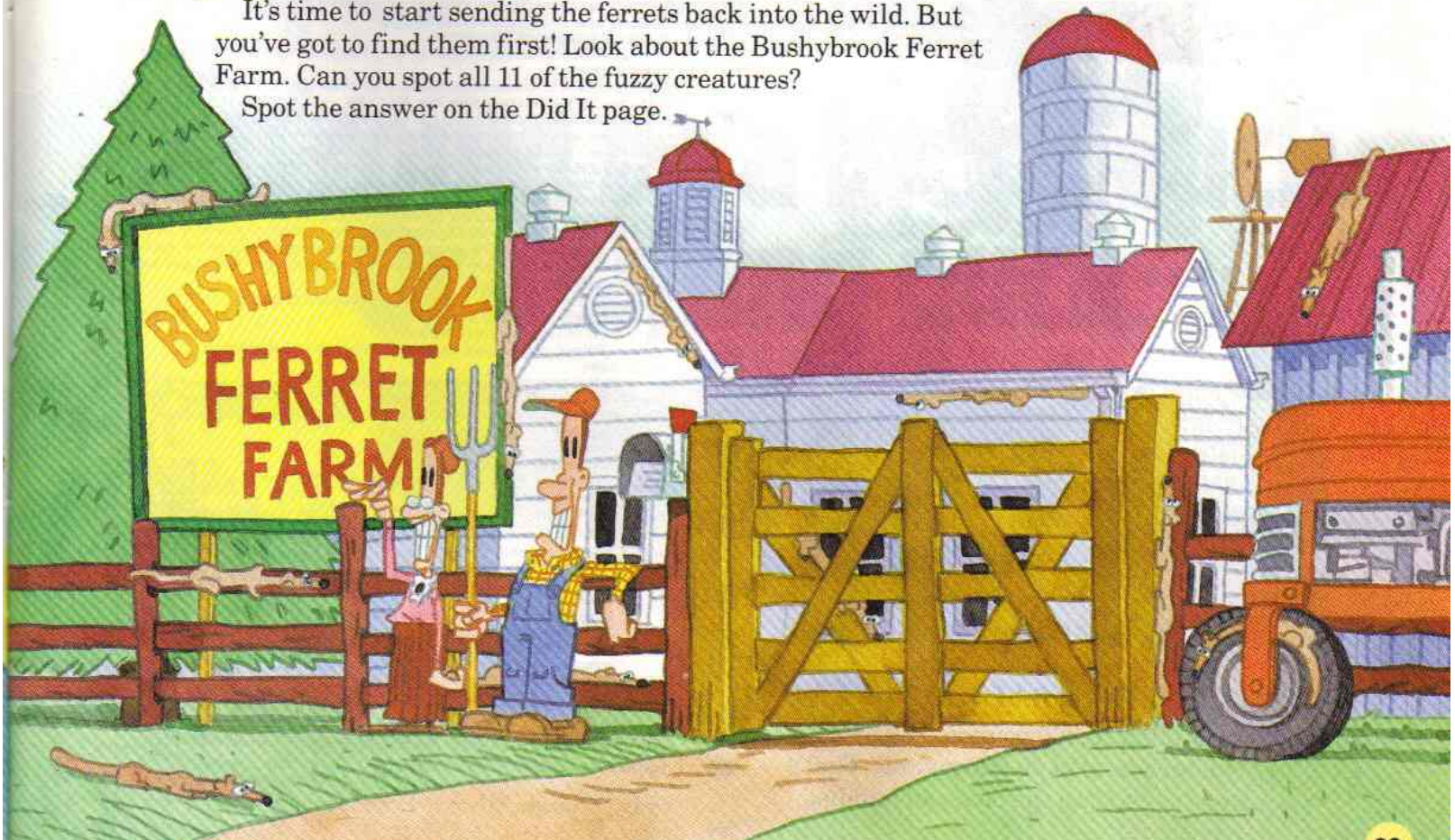


ILLUSTRATIONS BY RICHARD WEISS

BORN TO BE WILD

It's time to start sending the ferrets back into the wild. But you've got to find them first! Look about the Bushybrook Ferret Farm. Can you spot all 11 of the fuzzy creatures?

Spot the answer on the Did It page.



Did it

ILLINOIS BONES

Answer: TOOTHPICK

LEFTY OR RIGHTY?

1. Lefty 2. Righty 3. Righty 4. Lefty

ROAD RIDDLE

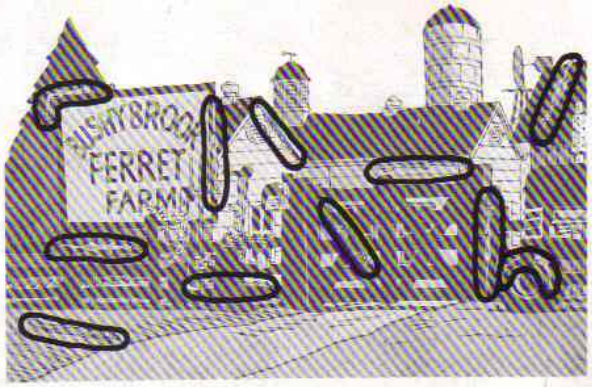
The sun was shining. The police officer starts work at midnight.

WHEN IN ROME

Draw an "S" in front of the IX. Now it's six!

CHIP OFF THE OLD ROCKS

BORN TO BE WILD



AMERICA'S PHONIEST VIDEOS

Five tons is equal to 10,000 pounds. The four elephants weigh a total of 40,000 pounds. That's 20,000 pounds more than the boat can handle.

NEXT MONTH

Here's a look at what you'll find in the March issue of CONTACT:

THE GREATEST VOYAGE

Three kids record their amazing adventures on a dream vacation—sailing to the Galapagos Islands, a place filled with weird and wonderful animals.

RIDING HIGH

Flying cars aren't science fiction, they're science fact. Learn about how people may soon be driving cars *above* our highways.

BIG FOOT LIVES!?

Legend says that a monster called Big Foot roams the forests of the Pacific Northwest. Is he real? Read the story and make up your own mind.

AND MUCH, MUCH MORE

STATEMENT OF OWNERSHIP MANAGEMENT AND CIRCULATION REQUIRED BY THE ACT OF AUGUST 12, 1970: SECTION 3685, TITLE 39, UNITED STATES CODE

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9. For Completion by Nonprofit Organizations Authorized to Mail at Special Rates (Section 423.12 DMM only) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes has not changed during preceding 12 months.

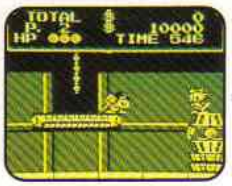
		Average Number of Copies Each Issue During Preceding 12 Months:	Actual Number of Copies of Single Issue Published Nearest to Filing Date:
(A)	Total No. Copies (net press run)	492,828	471,613
(B)	Paid and/or Requested Circulation		
	1. Sales through dealers and carriers, street vendors and counter sales	0	0
	2. Mail subscription (paid and/or requested)	474,980	462,329
(C)	Total Paid and/or Requested Circulation	474,980	462,329
(D)	Free distribution by mail, carrier or other means: samples, complimentary and other free copies	15,385	1,208
(E)	Total Distribution (sum of C and D)	490,365	463,537
(F)	Copies not distributed		
	1. Office use, left over, unaccounted, spoiled after printing	2,463	8,076
	2. Return from News Agents	0	0
(G)	TOTAL (Sum of E, F1 and 2–should equal net press run shown in A)	492,828	471,613

I certify that the statements made by me above are correct and complete.
WILLIAM HITZIG, General Manager

You could be a lucky duck. Or a sitting duck.

Better pogo jump this snake, or he's going to get too close for comfort.

Be sharp! The world's biggest diamond is buried here.



Pssst! Little Webby can help you find the moon's secret. If aliens don't find you first.

Find the five lost treasures of the universe and you'll be a zillionaire. But watch your tail, Scrooge McDuck. Not even Huey, Dewey and Louie can protect you from all the dangers you'll face on this Nintendo adventure, as you travel from the Amazon to the moon.

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